THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXXI. No. 1825.] LONDON, MAY 3, 1898. [50TH YEAR. PRICE 6d.

TUBES AND FITTINGS
FOR
GAS, STEAM, WATER,
AND ALL PURPOSES,
ALSO
COILS OF EVERY SIZE AND SHAPE.

Apply to the Original Firm of
JOHN BROTHERTON
LIMITED,
Imperial Tube Works, Monmore Green,
WOLVERHAMPTON.
ESTABLISHED 1861.

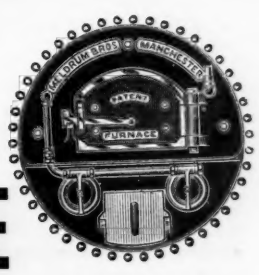
Lanemark Coal Co.,
LIMITED.
LANEMARK CANNEL AND GAS COALS.
Quotations and Analysis on Application to
LANEMARK COLLIERY,
NEW CUMNOCK, N.B.
Shipping Ports: All the principal Scotch Ports.

— ESTABLISHED 1830. —
PARKER & LESTER,
Manufacturers & Contractors.
THE ONLY MAKERS OF
PATENT ANTIMONY PAINT,
Parker's Imperial Black Varnish,
Oxide Paints, Oils, and General Stores, for Gas and Water Works.
WORKS:
ORMSIDE STREET, OLD KENT ROAD,
LONDON.

ROBERT MARSHALL,
CANNEL COAL MERCHANT,
97, WELLINGTON STREET, GLASGOW.
Prices and Analysis of all the Scotch Cannels on Application.

NORTON'S PATENT
"ABYSSINIAN" & ARTESIAN TUBE WELLS,
FOR TOWN WATER-WORKS AND OTHER SUPPLIES.
The following Town Water-Works Supplies have been obtained by this System, viz.:—Abbott's Langley, Aldershot, Alnwick, Cirencester, Hertford Lechlade, St. Albans, Shrewsbury, Skegness, Southampton, Stony Stratford, Swansea, Wallingford, Watford, West Worthing, Wimborne, &c.
LE GRAND & SUTCLIFF,
HYDRAULIC ENGINEERS, 100, BUNHILL ROW, LONDON, E.C.

"MELDRUM'S"
PATENT
BREEZE FURNACE



Now used in most of the Gas-Works in this Country for burning
COKE BREEZE, PAN BREEZE, SWEEPINGS, COAL DUST, &c.
5600 in use.

MELDRUM BROS., Atlantic Works, **MANCHESTER,**
Also at LONDON, LEEDS, LIVERPOOL, BIRMINGHAM, NEWCASTLE, and GLASGOW.
Branch Houses at PARIS, NEW YORK, BOMBAY, TOKIO, and SYDNEY.

DANIEL HOWARD,

(Successor to the late BENJ. WHITEHOUSE),

GASHOLDER & BOILER WORKS,

WEST BROMWICH, NEAR BIRMINGHAM

(ESTABLISHED 1765).

MANUFACTURER OF TELESCOPIC AND SINGLE GASHOLDERS,

WROUGHT AND CAST IRON TANKS FOR DITTO,

PURIFIERS, CONDENSERS, SCRUBBERS, HYDRAULIC MAINS, and all kinds of GAS APPARATUS,

Wrought-Iron Roofs, Bridges, Girders, &c.,

Steam, Hot Water, and Range Boilers, Tanks, Cisterns, Boats, and all kinds of Wrought-Iron Work.

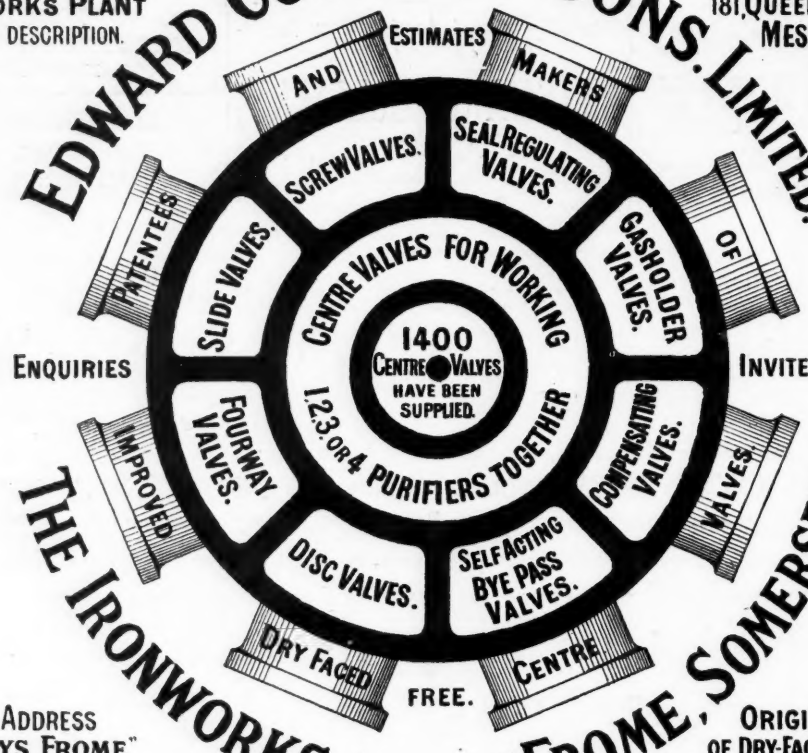
DRAWINGS, SPECIFICATIONS, AND ESTIMATES SUPPLIED ON APPLICATION.

PATENT ADJUSTABLE OVERFLOWS.

ENGINEERS & CONTRACTORS FOR GAS WORKS PLANT OF EVERY DESCRIPTION.

LONDON OFFICE: BRIDGE HOUSE 181, QUEEN VICTORIA ST. E.C. MESSRS. BALE & HARDY, AGENTS.

EDWARD COCKEY AND SONS, LIMITED.



PATENT WASHERS

PATENT COMBINED BYE-PASS & COMPENSATOR FOR EXHAUSTERS.

THE IRONWORKS, FROME, SOMERSET.

TELEGRAPHIC ADDRESS "COCKEYS FROME" "DAMPER LONDON"

ORIGINAL MAKERS OF DRY-FACED CENTRE VALVES. ESTABLISHED OVER HALF A CENTURY.

PATENT FIRE DOORS & FRAMES.

HIGHEST AWARDS—LONDON, PARIS, COLOGNE, VIENNA, MELBOURNE, AND OTHERS.

—11 MEDALS.—

MANUFACTURERS OF TUBES AND FITTINGS OF EVERY DESCRIPTION.

WROUGHT-IRON OR STEEL MAINS UP TO 6 FEET DIAMETER, FOR GAS, WATER, OIL, OR OTHER PURPOSES.

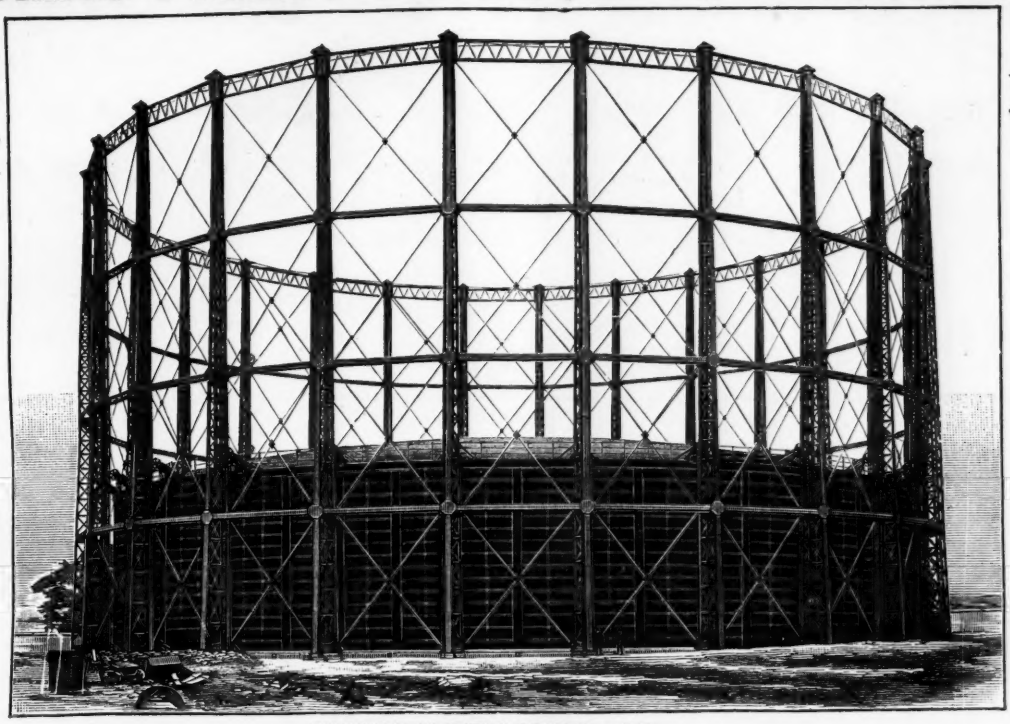
SCREWING TACKLE, BOILER MOUNTINGS, VALVES, COCKS, ETC.

LONDON: 108, Southwark Street. MANCHESTER: 33, King Street West. BIRMINGHAM: 114, Colmore Row. LEEDS: 6, Mark Lane, New Briggate.

THOMAS PIGGOTT & CO., LTD., BIRMINGHAM.

LONDON OFFICE: ST. THOMAS APOSTLE, E.C.

GAS PLANTS, BOILERS, ENGINES, PUMPS, ROOFS, RETORT-FITTINGS, ETC.



TELEGRAPHIC ADDRESS: ATLAS BIRMINGHAM

WELDED & RIVETED PIPES, FOUL MAINS, RETORT-LIDS, WROT & CAST TANKS, PURIFIERS.

MANUFACTURERS OF

Humphreys & Glasgow's Patent Carburetted Water-Gas Plant.

INSTALLATIONS HAVE ALREADY BEEN SUPPLIED, AND ARE IN HAND FOR THE FOLLOWING GAS-WORKS: COPENHAGEN, BELFAST, GLASGOW, BRUSSELS, SANTIAGO, SWANSEA, TOTTENHAM, LIVERPOOL, BRIGHTON, BATH, PRESTON, SOUTHPORT, NEW YORK, NEWBURGH (N.Y.), NEWBURGH (SECOND CONTRACT), HOYLAKE, BELFAST (SECOND CONTRACT), EDINBURGH, TOTTENHAM (SECOND CONTRACT), WINCHESTER, MANCHESTER, BRUSSELS (SECOND CONTRACT), ST. JOSEPH (MO.), HOLYOKE (MASS.), SHANGHAI, STOCKTON, STOCKPORT, NORWICH, GUILDFORD, SYRACUSE, BORDENTOWN, LEA BRIDGE, COVENTRY, COMMERCIAL, BRENTFORD, BRIDLINGTON, MIDDLESBROUGH, CROYDON, L. & N. W. RAILWAY CREWE, NINE ELMS, BROMLEY, COVENTRY (SECOND CONTRACT), TAUNTON, ROTTERDAM, DORKING, LEA BRIDGE (SECOND CONTRACT), LIVERPOOL (SECOND CONTRACT), SCARBOROUGH, DURHAM.

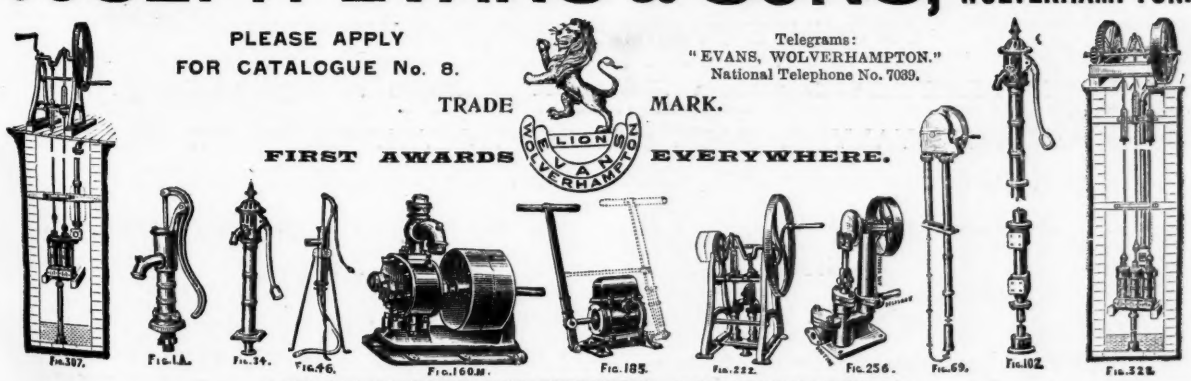
JOSEPH EVANS & SONS, CULWELL WORKS, WOLVERHAMPTON.

PLEASE APPLY FOR CATALOGUE No. 8.

Telegrams: "EVANS, WOLVERHAMPTON." National Telephone No. 7039.

TRADE MARK.

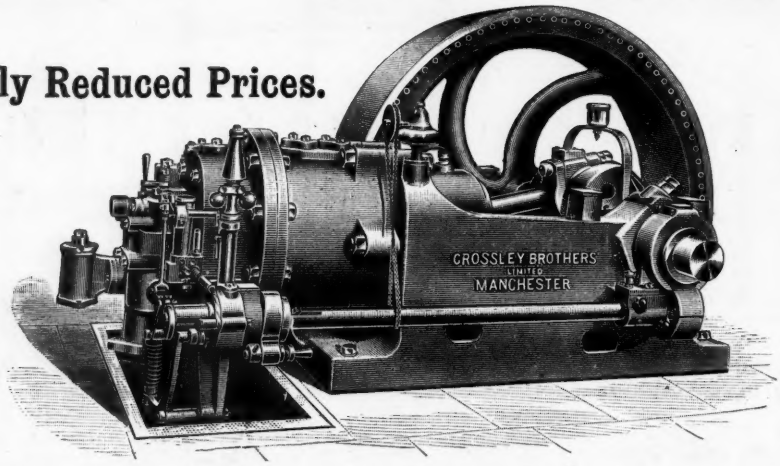
FIRST AWARDS EVERYWHERE.



SEE NEXT WEEK'S ADVERTISEMENT FOR STEAM-PUMPS, &c.

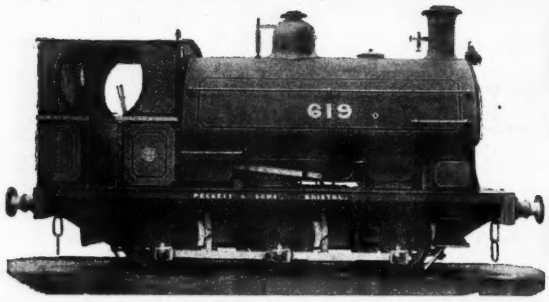
CROSSLEY'S "OTTO" GAS-ENGINES

Greatly Reduced Prices.



REPRESENTS NEW TYPE 40-HORSE POWER NOMINAL HIGH-SPEED ELECTRIC-LIGHT ENGINE.

CROSSLEY BROS., LTD., OPENSHAW, MANCHESTER.



LOCOMOTIVES

LOCOMOTIVES of all Sizes and Gauges specially constructed for Main and Branch Lines, Contractors, Docks, Gas-Works, Collieries, Iron-Works, Brick and Cement Works, &c. Locomotives of various Sizes always in Stock, ready for Immediate Delivery.

Photographs, Specifications, and Prices on Application.

PECKETT & SONS, Atlas Locomotive Works, **BRISTOL.**

Telegraphic Address: "PECKETT, BRISTOL."

NEWTON, CHAMBERS, & CO.,

LIMITED,

THORNCLIFFE IRON-WORKS, NEAR SHEFFIELD.

Established 1790

LONDON OFFICE: 19, Great George Street, WESTMINSTER.

Telegraphic Addresses: "NEWTON, SHEFFIELD," "ACCOLADE, LONDON."

GAS ENGINEERS, IRONFOUNDERS, & CONTRACTORS.

Manufacturers of every description of

PLANT, APPARATUS, and MACHINERY for GAS and CHEMICAL WORKS.

RETORTS and FITTINGS, MOUTHPIECES with Self-Sealing Lids.

Improved COAL and COKE HANDLING PLANT, CONVEYORS, and ELEVATORS,

CONDENSERS, SCRUBBERS, and WASHERS.

PURIFIERS with Planed Joints a Speciality.

Patent CENTRE-VALVES, RACK and SCREW VALVES, WOOD GRIDS, and SCRUBBER-BOARDS, CAST-IRON MAINS, and SPECIALS.

STRUCTURAL WORK, COLUMNS, GIRDERS, and ROOFING.

GASHOLDERS, Cast-Iron or Steel Tanks.

DESIGNS, SPECIFICATIONS, and ESTIMATES FREE.

PIG IRON (Special Quality) for Engine Cylinders. GAS COAL famous for its UNRIVALLED EXCELLENCE.

INCANDESCENT GAS-LIGHT

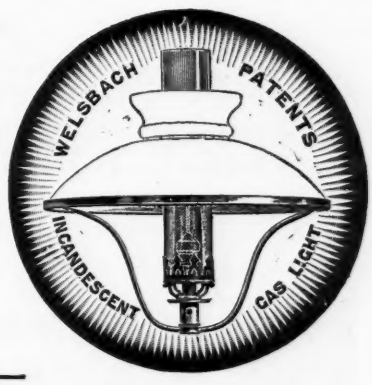
(WELSBACH PATENTS).

THE GREATLY REDUCED CONSUMPTION OF GAS COVERS THE INITIAL COST OF THE BURNER IN LESS THAN SIX MONTHS.

The Ordinary "C" Burner,
PRICE 6/6.

The "C" Bye-Pass Burner,
PRICE 7/6.

Prices of other Patterns Reduced Proportionately.



The attention of Gas Managers and Gas Engineers is called to this System of Lighting as one which tends to Popularize the Use of Gas as an Illuminant, owing to the following Advantages:—

Economy in Consumption of Gas, combined with High Illuminating Efficiency.
Freedom from Smoke, Dirt, and Flickering.
Greatly Reduced Heat.
The combination of High Lighting Power with DURABILITY can only be obtained by The Welsbach System.

The "Lancet" Special Analytical and Sanitary Commission, in an exhaustive report, pronounces the "Incandescent Gas-Light System" to be the Healthiest, Best, and most Economical System of Gas Lighting.

Suitable for every purpose of Inside and Outside Lighting.

Avoid the WORTHLESS IMITATIONS now being offered by UNSCRUPULOUS INFRINGERS.

OVER ONE HUNDRED AND FIFTY JUDGMENTS

and Interim Injunctions recently obtained against Companies, Firms, and Persons INFRINGING THE "WELSBACH" PATENTS, or INFRINGING THE LIMITED LICENSE under which the Mantles are sold.

FOR FURTHER PARTICULARS, APPLY TO

THE INCANDESCENT GAS-LIGHT COMPANY, Ltd.,
PALMER STREET, WESTMINSTER, LONDON, S.W.

OIL FOR GAS MAKING

PURE DISTILLATE.

HOMOGENEOUS IN CHARACTER.

NO MIXTURE.

CAN BE STORED SAFELY ANYWHERE.

FLASH POINT GUARANTEED OVER 200° FAHR.

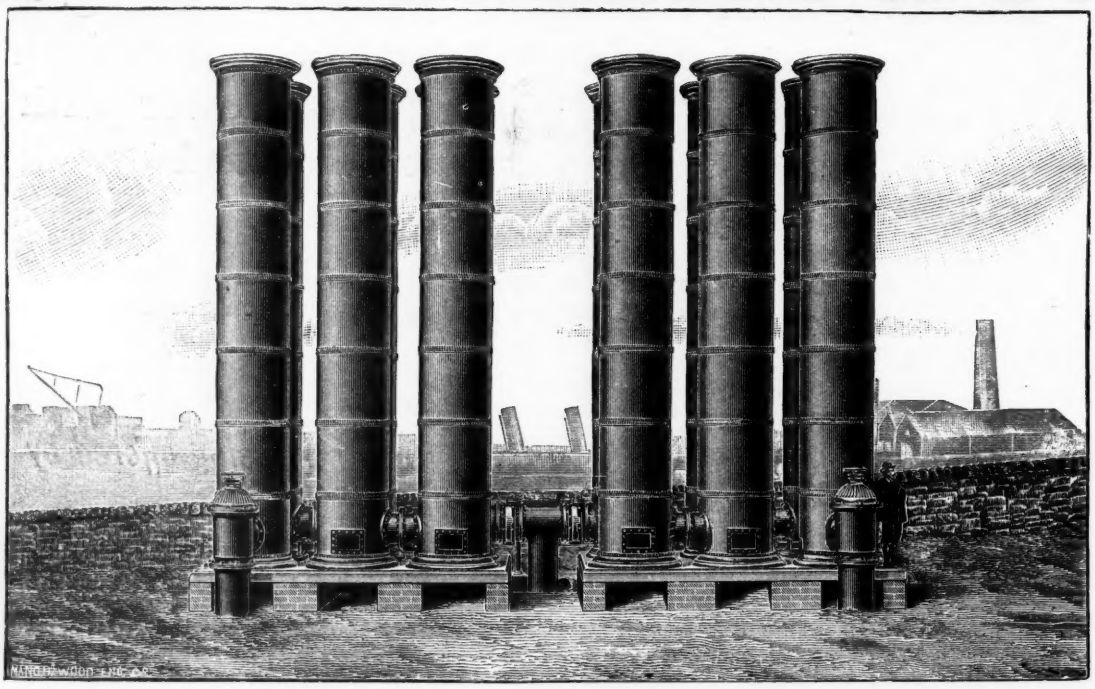
(ABEL'S CLOSED TEST.)

ANGLO-CAUCASIAN OIL COMPANY, LTD.

18 & 19, GT. ST. HELEN'S, LONDON. | INDIA BUILDINGS, CROSS ST., MANCHESTER.

W. C. HOLMES & Co.

CATALOGUES SENT POST FREE ON APPLICATION.



Telegrams: "HOLMES, HUDDERSFIELD;" "IGNITOR, LONDON."

A Set of Twelve Condensers, 4 ft. diameter by 28 ft. high. *From a Photograph.*

Makers of Retort Ironwork, Patent Scrubber-Washers, Purifiers, Gasholders of all sizes, and Gas Plant and Structural Ironwork of every description.

WHITESTONE IRON-WORKS, HUDDERSFIELD

TROTTER, HAINES, & CORBETT,

Brettell's Estate

FIRE-CLAY & BRICK WORKS,

STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.

Proprietors of

BEST GLASSHOUSE POT & CRUCIBLE CLAY.

SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

LONDON OFFICE: R. CULL, 84, OLD BROAD ST., E.C.

JAMES OAKES & Co.,

ALFRETON IRON-WORKS, DERBYSHIRE,

AND

Wenlock Iron Wharf, 21 & 22, Wharf Road, CITY ROAD, LONDON, N.,

Manufacture and keep in Stock at their Works (also large stock in London)

PIPES and CONNECTIONS, 1¼ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with bolts, nuts and covers, and rendering leakage impossible.

HEATHCOTE GAS COAL.

Rich in Illuminating Power and Yield of Gas. Above the Average in Weight and Quality of Coke.

Maintains a High Standard in Residuals.

THE GRASSMOOR CO., LD.

CHESTERFIELD.

THORNLEY GAS COALS

WORKED BY THE

WEARDALE IRON & COAL Co., LD.

OUT OF THEIR

THORNLEY AND WHEATLEY HILL COLLIERIES.

Analysis made by

Messrs. J. & H. S. PATTINSON, *May 28, 1895.*

Yield of Gas per Ton	10,500 Cub. Ft.
Illuminating Power	16·9 Candles.
Coke (of good quality)	67·5 per Cent.
Sulphur	0·58 ,,
Ash	2·78 ,,

For Price, &c., apply to the

WEARDALE IRON & COAL Co., LD.

QUAYSIDE, NEWCASTLE-ON-TYNE.

WELDON MUD

FOR

GAS PURIFICATION,

For use in the

RECOVERY OF SULPHUR,

ALSO

Removal of last Traces of SULPHURETTED HYDROGEN in catch position.

Full Particulars on application to the Patentees:

GAS DESULPHURIZATION CO.,

— *LIMITED,* —

1, FENCHURCH AVENUE, LONDON, E.C.

WATERBLEAN PAINT

TELEGRAMS: "EVESON, BIRMINGHAM."

EVESON FOR CANNEL

TUBES AND FITTINGS

ALL KINDS

WRITE FOR PRICES

STAFFORDSHIRE TUBE Co., BIRMINGHAM.

THOMAS DUXBURY & CO.,

16, DEANSGATE, MANCHESTER.

Best Gas Coal and Cannel, giving High Illuminating Power, Large Yield per ton, and reasonable in Price.

Telegrams: "DARWINIAN, MANCHESTER." Telephone 1806.

THOMAS TURTON AND SONS, LIMITED,

SHEAF WORKS, SHEFFIELD,

MANUFACTURERS OF

FILES OF BEST QUALITY

FOR ENGINEERS.

STEEL OF ALL DESCRIPTIONS.

SCREW STOCKS, TAPS AND DIES, SPANNERS, RATCHET BRACES, LIFTING JACKS, ANVILS, VICES, AND ENGINEERS' TOOLS GENERALLY.

LONDON OFFICE:

90, CANNON STREET, E.C.

Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887, for

CANNEL & COAL.

TYNE

BOGHEAD CANNEL.

Yield of Gas per ton	13,155 cub. ft.
Illuminating Power	38·23 candles.
Coke per ton	1,301·88 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	17·8 candles.
Coke	70 per cent.

SOUTH PELAW MAIN GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	73·1 per cent.

For Prices and complete Analysis, apply to

THOS. W. DANCE & SONS,

COAL OWNERS, NEWCASTLE-ON-TYNE:

OR

E. FOSTER & CO.,

21, JOHN STREET, ADELPHI, LONDON W.C.

WELLS' LIGHTNING PAINTER

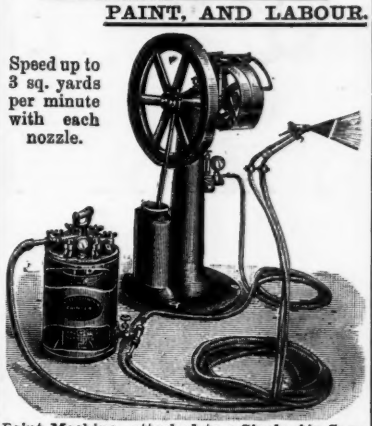
LIME AND COLOUR WASHER.

(WALLWORK & WELLS' PATENTS.)

PAINTING BY MACHINE.

GREAT SAVING IN TIME, PAINT, AND LABOUR.

Speed up to 3 sq. yards per minute with each nozzle.



Paint Machine, attached to a Single Air-Compressor, Driven by Belt Power. Can also be driven from existing Air Mains.

No. 1	Painter	£25	Single Air Compressor	£17 10
No. 2	,,	£30		
No. 3	,,	£35	Double ditto	£27 0

Supplied to **6** Governments, the principal Railway Companies, Gas-Works, and leading Firms in Great Britain.

Over 180 Plants Sold.

Vertical Steam-Engine and Air-Compressor combined with Boiler on Wheel Base. Price, complete with all Fittings, £100. No. 2 Painter, extra, £30.

Hand Compressor and Paint Holder and Sprayer combined, for Stencilling Letters, Ornamental Designs, Decorative Work, and any class of Painting where the work is not very heavy or continuous **£20**

(OVER 1 SQUARE YARD PER MINUTE.)

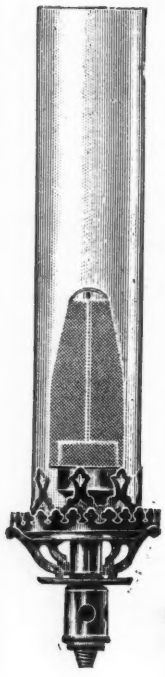
A. C. WELLS & CO. 113, Midland Rd., St. Pancras, LONDON.

Branch: CHEETHAM, MANCHESTER.

THE SUNLIGHT INCANDESCENT GAS-BURNER.

NEW POPULAR PRICES.

BURNERS

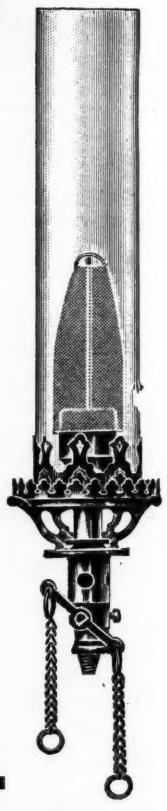


COMPLETE FROM

3/10 each.

WITH BYE-PASS, 5/-.

MANTLES



per 9/- doz.

THE IDEAL LIGHT FOR DOMESTIC USE.

SUNLIGHT MANTLES

PRODUCE A DIFFUSED LIGHT OF SOFT RAYS,

The NEAREST APPROACH to the LIGHT of the SUN.

Price Lists, &c., on application.

The NEW INCANDESCENT (SUNLIGHT PATENT) GAS LIGHTING CO., LIMITED,

33 & 34, SHOE LANE, LONDON.

GIBBONS BROTHERS, LIMITED,

Telegraphic Address: "GIBBONS, DUDLEY."

DUDLEY,

Telephone No. 8013.

GAS ENGINEERS, CONTRACTORS, RETORT SETTERS.

Patent REGENERATIVE SETTINGS,

GIBBONS & MASTERS' PATENT No. 1269, 1893.

SUITABLE FOR WORKS OF EVERY CAPACITY,

AND A SPECIAL FORM OF WHICH IS APPLICABLE TO

GASEOUS FIRING WITH A MINIMUM EXCAVATION.

RETORT-BENCH IRONWORK, CONDENSERS, SCRUBBERS, PURIFIERS, VALVES, &c.

DESIGNS AND ESTIMATES ON APPLICATION.

Telephone No. 103. Telegraphic Address: "ELEVATOR, HASLINGDEN."

S. S. STOTT & CO.,

ENGINEERS, HASLINGDEN, NR. MANCHESTER.

COAL AND COKE ELEVATORS & CONVEYORS.

COAL AND COKE STORAGE PLANTS.

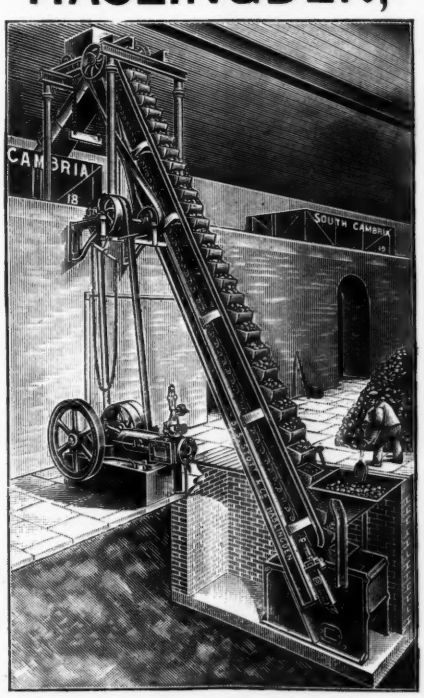
COAL AND COKE BREAKERS.

WHARF ELEVATORS FOR UNLOADING BARGES.

ELEVATORS & CONVEYORS for BOILER-HOUSES.

STAMPED AND RIVETED STEEL ELEVATOR BUCKETS.

DETACHABLE CHAINS AND SPROCKET WHEELS.



Coke Elevator Loading Railway Waggons.

LIME AND OXIDE ELEVATORS & CONVEYORS.

HIGH-CLASS STEAM-ENGINES up to 1000-Horse Power.

PUMPS, HORIZONTAL AND VERTICAL, SINGLE, DOUBLE, or THREE-THROW, for WATER-WORKS, &c.

BEAM PUMPING-ENGINES.

AIR-COMPRESSORS.

BELT PULLEYS, ROPE PULLEYS, GEARING, &c., &c.

TELEGRAMS: "FIRECLAY," LEEDS.

TELEPHONE No. 612.

COAL and COKE
Breakers, Elevators,
AND
Conveyors.

RETORTS,
Bricks, Blocks, Tiles,
&c.

ENGINEERS IRONFOUNDERS
EVERY
DESCRIPTION OF
RETORT SETTINGS
AND
IRONWORK.
WE GUARANTEE
RESULTS.
CONTRACTORS MANUFACTURERS

BUILDINGS,
ROOFS.

RE-SETTING
RETORTS.

We desire to call attention to our SHALLOW REGENERATIVE SETTINGS, which are comparatively inexpensive to erect, and productive of excellent results. They are specially designed to suit those Retort Houses where for various reasons it is undesirable to excavate to any great depth.

We shall be pleased to furnish Designs and Estimates on application.

THE LEEDS FIRECLAY CO. LTD., ENGINEERING DEPARTMENT, WORTLEY, nr. LEEDS.

THE "TRAFALGAR"

PREPAYMENT GAS-METER

FOR PENCE, SHILLINGS, OR ANY COINAGE.

THE ADVANTAGES OF THIS SYSTEM ARE:

1. Simplicity of Mechanism.
2. Absolute Accuracy.
3. Impossibility of being tampered with.
4. Unaffected by irregularities in shape or thickness of the penny.
5. Can be fixed to any ordinary Wet or Dry Meter.
6. Extra large Money-Box.
7. Price Changer can be altered without otherwise disturbing the Meter.
8. Index showing number of Pennies in the mechanism at any time.
9. Rejection of Half-Pennies certain.

GUARANTEED FOR FIVE YEARS.

FRANK WRIGHT'S PREPAYMENT GAS-METER CORPORATION, Limited,

Telegraphic Address: "Gasometer, London."

Manufacturers of Wet and Dry Gas-Meters.
Offices and Works: 62, GLENGALL ROAD, S.E.

Telephone No. 59 Peckham.

ARROL-FOULIS

PATENT HYDRAULIC MACHINERY

FOR

CHARGING AND DRAWING GAS-RETORTS

SIR WILLIAM ARROL & CO., Ltd., Sole Makers,
DALMARNOCK IRON-WORKS, BRIDGETON,
GLASGOW.

LONDON ADDRESS: 32, VICTORIA STREET, WESTMINSTER, S.W.

PLANS AND ESTIMATES FURNISHED ON APPLICATION.

THE
ARROL-FOULIS
MACHINES
Are Employed at the following Works—

GLASGOW GAS-WORKS—
Tradeston.
Dawsholm.
Dalmarnock.

GASLIGHT & COKE COMPANY—
Beckton.

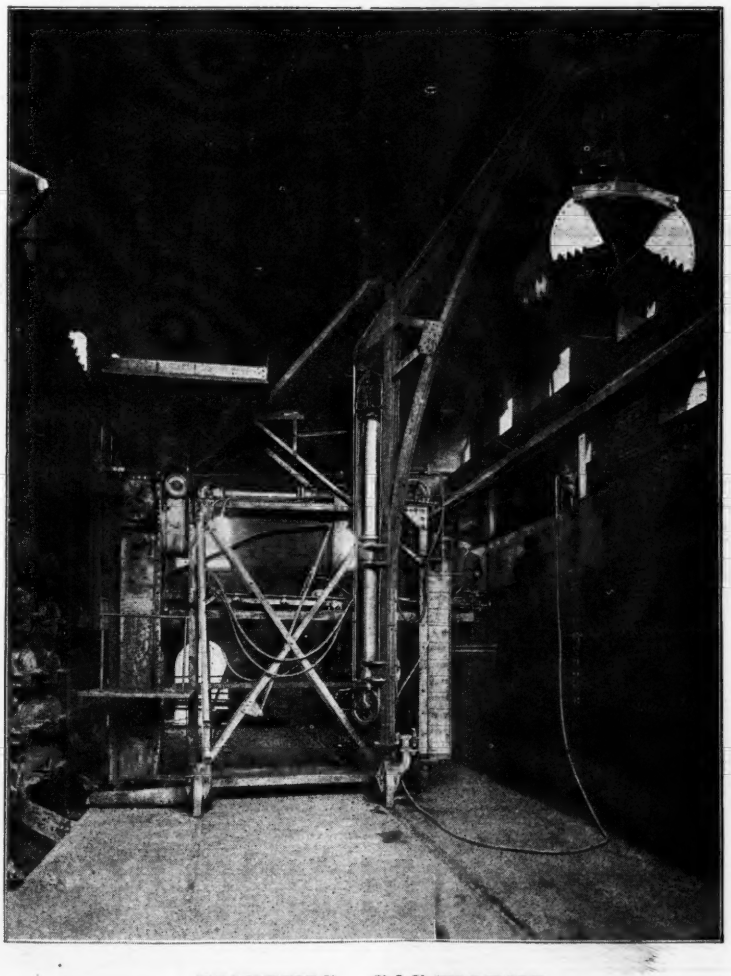
SOUTH METROPOLITAN GAS COMPANY—
East Greenwich
Vauxhall.
Rotherhithe.

COMMERCIAL GAS-WORKS—
Wapping.
Poplar.

BROMLEY GAS-WORKS (KENT).

EDINBURGH GAS-WORKS.

LIVERPOOL GAS-WORKS.



THE
ARROL-FOULIS
MACHINES
Are Employed at the following Works—

LEEDS GAS-WORKS.

BIRMINGHAM GAS-WORKS.

BRITISH GAS CO.—
Hull.

BOLTON GAS-WORKS.

IMPERIAL CONTINENTAL GAS ASSOCIATION—
Amsterdam.
Vienna.

HAGUE CORPORATION GAS-WORKS—
Hague.

METROPOLITAN GAS-WORKS—
Melbourne.

CLEVELAND GAS-WORKS—
Cleveland, Ohio,
&c , &c., &c.

OVER 200 MACHINES ARE AT WORK OR IN COURSE OF CONSTRUCTION.

WAPPING GAS-WORKS.

THE TIME TAKEN TO DRAW AND CHARGE EACH RETORT BY THESE MACHINES AVERAGES

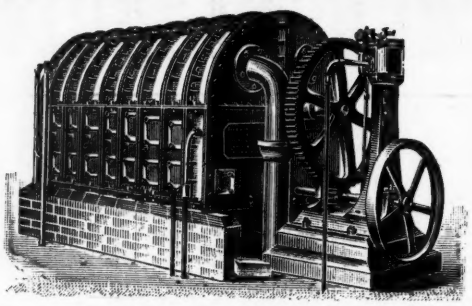
ONE MINUTE.

KIRKHAM, HULETT, & CHANDLER, Ld.

3 & 4, PALACE CHAMBERS, BRIDGE STREET, WESTMINSTER, S.W.

PATENT "STANDARD" WASHER-SCRUBBER.

This Apparatus upholds its title, the "STANDARD;" being recognized by leading Engineers as the most efficient Apparatus for the Extraction of Ammonia from Coal or other Gases.



The Largest Order ever given for WASHER-SCRUBBERS was recently received being for **16** Patent "Standard" Washer-Scrubbers, each for 3,500,000 Cubic Feet of Gas per day.

Number of Patent "STANDARD" Washer-Scrubbers in use at this date

540

THE WIGAN COAL & IRON CO., LIMTD.,

Are exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES, and supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, &c.

Midland District Office: PRINCE'S CHAMBERS, 6, CORPORATION STREET, BIRMINGHAM—Sole Agent: A. C. SCRIVENER.

TELEGRAPHIC ADDRESS: "WIGAN BIRMINGHAM." TELEPHONE No. 200.

London District Office: 6, STRAND, LONDON—C. PARKER & SON, Sole Agents.

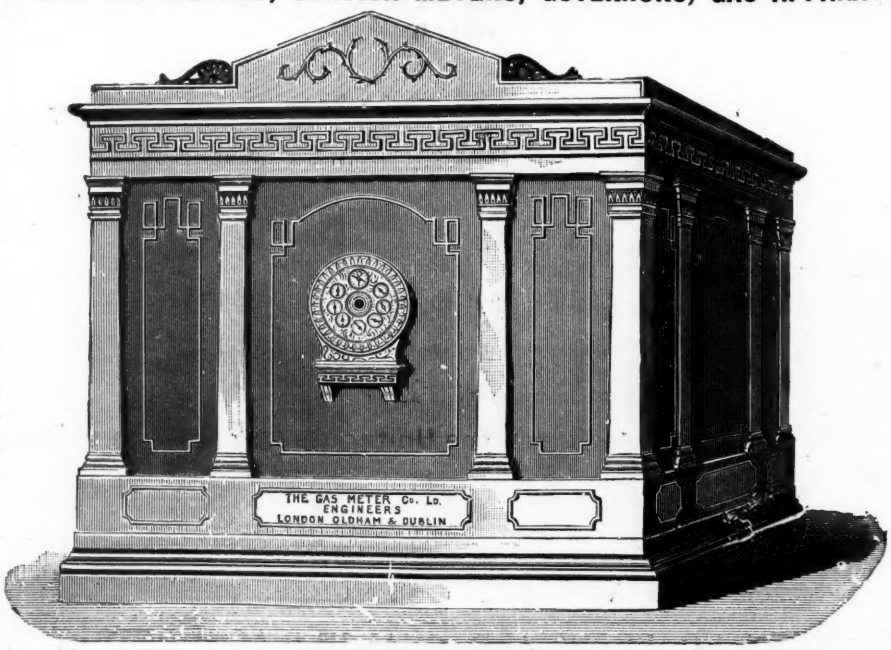
TELEGRAPHIC ADDRESS: "PARKER, LONDON."

THE GAS-METER COMPANY, LIMITED,

MANUFACTURERS OF

WET AND DRY GAS-METERS, STATION METERS, GOVERNORS, GAS APPARATUS, ETC.

SQUARE STATION METERS WITH PLANED JOINTS.



STATION METERS IN CYLINDRICAL CASES.

DESIGN No. 2 PATTERN.

STATION METERS MADE AT THE COMPANY'S WORKS, OLDHAM, LATE WEST & GREGSON. Established 1830.

For Prices and Particulars apply to

R. L. ANDREWS, General Manager.

Works: 238, KINGSLAND ROAD, LONDON; UNION STREET, OLDHAM; HANOVER STREET, DUBLIN.

Telegraphic Address: "METER."

[See Advertisement on back of Wrapper.

ALEX. C. HUMPHREYS, M.Inst.C.E. A. G. GLASGOW, M.E.

SINCE 1893

MESSRS. HUMPHREYS & GLASGOW

Have constructed or have in hand

CARBURETTED WATER-GAS PLANT

FOR THE FOLLOWING UNDERTAKINGS:—

	Cub. Ft. Daily.		Cub. Ft. Daily.
Copenhagen	700,000	Edinburgh	2,000,000
Belfast	1,700,000	St. Joseph, Mo.	750,000
Belfast (Second Contract)	4,500,000	Lea Bridge	350,000
Brussels	700,000	Lea Bridge (Second Contract)	350,000
Brussels (Second Contract)	700,000	Guildford	350,000
Liverpool	3,500,000	Stockton-on-Tees	500,000
Liverpool (Second Contract)	4,500,000	Syracuse, N.Y.	850,000
Tottenham	750,000	Brentford	1,200,000
Tottenham (Second Contract)	750,000	Commercial Gas Co.	850,000
Santiago	400,000	Commercial Gas Co. (Second Contract)	850,000
Swansea	750,000	Commercial Gas Co. (Third Contract)	1,250,000
Manchester	3,000,000	Bridlington	125,000
Brighton	1,750,000	Middlesbrough	1,250,000
Preston	1,500,000	Croydon	1,250,000
New York	1,200,000	L. & N.W. Railway, Crewe	700,000
Southport	750,000	Taunton	225,000
Bath	1,000,000	Lawrence, Mass.	400,000
Newburgh, N.Y.	350,000	Rotterdam	850,000
Newburgh, N.Y. (Second Contract)	250,000	Dorking	125,000
Hoylake	125,000	McKeesport, Pa.	500,000
Coventry	600,000	The Gaslight and Coke Co., Bromley	3,750,000
Coventry (Second Contract)	600,000	The Gaslight and Coke Co., Nine Elms	2,750,000
Bordentown, N.J.	125,000	Durham	200,000
Winchester	200,000	New York (Remodelled)	11,000,000
Shanghai	225,000	Scarborough	800,000
Stockport	500,000	Perth, W.A.	125,000
Norwich	1,000,000	Bremen	550,000
Holyoke, Mass.	600,000	Maidenhead	225,000

In addition to which the 1891 Installations of The Gaslight and Coke Company, on the Humphreys' Double-Superheater System, have a capacity of 12,000,000 Cubic Feet per diem.

IN THE UNITED STATES,

Messrs. Humphreys and Glasgow and the United Gas Improvement Company have jointly constructed **270** Sets of Humphreys' Double-Superheater Apparatus; **157** of these since **1893.** This Company (of which Mr. Humphreys was formerly Chief Engineer) was, until lately, the largest Contractor for Carburetted Water-Gas Apparatus in the World.

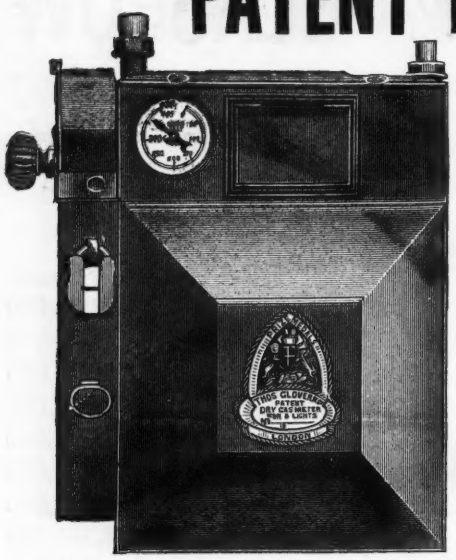
MESSRS. HUMPHREYS & GLASGOW, OF LONDON, NOW HOLD THAT POSITION.

9, VICTORIA STREET, LONDON, S.W.
Telegrams: "EPISTOLARY, LONDON."

UNITED STATES OFFICE:
BANK OF COMMERCE BUILDING, NEW YORK.

THOMAS GLOVER & CO.'S

PATENT NEW IMPROVED PREPAYMENT METER



For Pennies, Shillings, or any Coin.

Simple in Mechanism.
Positive in Results.
Price Changer *in Situ.*

GUARANTEED FOR FIVE YEARS.

Telegraphic Address: "GOTHIC, LONDON." Telephone No. 725 Holborn.

THOMAS GLOVER & CO., LTD.,

DRY GAS-METER MANUFACTURERS,

214 to 222, ST. JOHN ST., CLERKENWELL GREEN, LONDON, E.C.

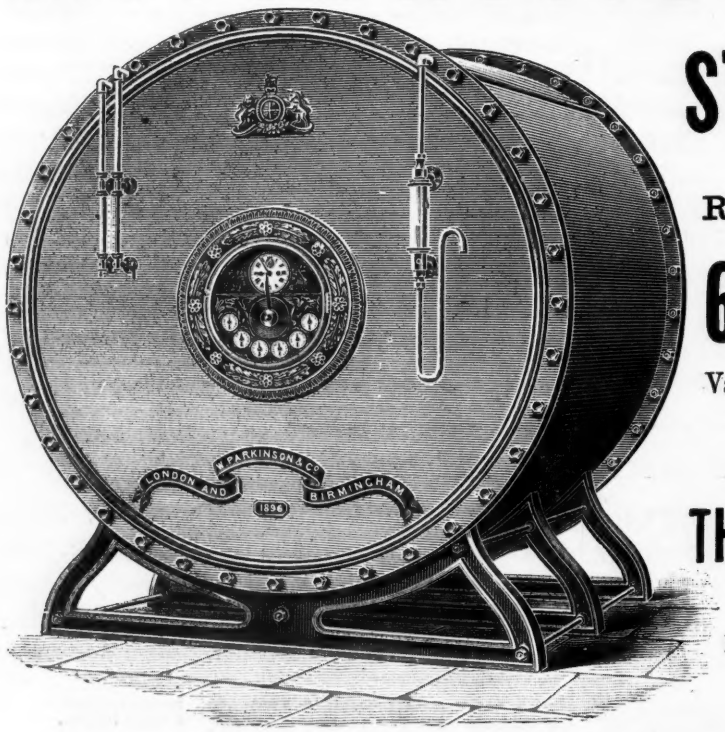
BRISTOL: 28, BATH STREET. *Telegraphic Address:* "GOTHIC." Telephone No. 1005.

BIRMINGHAM: 1, OOZELLS STREET. *Telegraphic Address:* "GOTHIC."

MANCHESTER: 37, BLACKFRIARS STREET. *Telegraphic Address:* "GOTHIC."

GLASGOW: ARGYLE WORKS, KINNING PARK. *Telegraphic Address:* "GASMAIN." Telephone No. 1525 South Side.

W. PARKINSON & Co



STATION METERS

IN

ROUND or SQUARE TANKS.

OVER

600 STATION METERS,

Varying in size from **1200** to **250,000** cubic feet per hour, have been sold fitted with

THREE-PARTITION DRUMS.

DURABILITY UNEQUALLED. SOME HAVE BEEN IN CONSTANT USE FOR OVER 60 YEARS.

COTTAGE LANE WORKS, CITY ROAD,
LONDON.
Telegraphic Address: "INDEX." Telephone No. 778 King's Cross.

BELL BARN ROAD WORKS,
BIRMINGHAM.
Telegraphic Address: "GAS-METERS." Telephone No. 1101.

[See also Advt. p. 1040.

CONTENTS.

EDITORIAL NOTES:—

GAS, LIGHTING, &c.— PAGE

The Meeting of the North of England Gas Managers' Association 991
An Innocent Sufferer from a Gas Explosion 992
The Close of the Petroleum Inquiry—Death of Col. Sir V. Majendie 992
The House of Lords' Judgments. 992
The South Wales Colliers' Strike 992
The Truck Acts, and Works Benefit Clubs 993

WATER AND SANITARY AFFAIRS—

The Progress of the Metropolitan Water Inquiry—The Evidence of Mr. Goldney and Sir A. Arnold 993
Commencement of the Staines Reservoirs Scheme 994

ESSAYS, COMMENTARIES, AND REVIEWS:—

Gas and Water Companies in the Stock Market 994
Electric Lighting Memoranda 994
The Prospect of Cheaper Electrical Supply 995
The Staines Reservoirs Scheme. 996
Coke-Breeze Concrete Building Construction 997

NOTES:—

Steam-Boilers for Road Carriages 998
An Unsatisfactory Water-Main 998
The Storage of Energy 998
The Paris Sewage Farm 999

TECHNICAL RECORD:—

North of England Gas Managers' Association—Half-Yearly Meeting at Newcastle-on-Tyne—
General Business. 999
Mr. D. Terrace on Carburetted Water Gas. 999
Mr. C. Dru Drury on Economical Methods of Raising Steam on Gas-Works 1004
The Workmen's Compensation Act 1006
Standardizing Meter-Unions 1007
The Young and Glover System of Removing Naphthalene and Carburetting Gas. 1008
Gas-Engine Research 1008
The New Welsbach Burner 1009
The Jena Incandescent Gas Bulb 1010
Messrs. Gwynne and Co.'s New Gas-Exhausting Machinery . . 1011

REGISTER OF PATENTS:—

Removing Scurf from Gas-Retorts—Billington, C., jun. . . . 1012
Price-Changing Mechanism for Coin-Freed Gas-Meters—Glover, R. T. & J. G. 1012
Incandescent Gas-Lights—Léry, J. B. de 1012
Bunsen Burners for Incandescent Lighting—Himmel, G. . . . 1012
Gas or Petroleum Engines—Bapst, G., and Grelet, A. 1012
Enriching Gas of Low Illuminating Power—Imray, O. (Pilous, E., and Michaelis, A.) 1013
Patent Notices 1013

CORRESPONDENCE:—

Mr. George Livesey and the Management of The Gaslight and Coke Company 1013
The Dundee Gas Commission and Enrichment—A Correction . 1013
The Generation of Electricity at Gas-Works 1013

PARLIAMENTARY INTELLIGENCE:—

Progress of Bills 1014
House of Commons Committee—Staines Reservoirs Joint Committee Bill 1014

LEGAL INTELLIGENCE:—

Another Claim arising out of the Poplar Gas Explosion . . . 1015
Action for Alleged Damage Caused by the Morley Corporation Water-Works 1015

MISCELLANEOUS:—

The New Works of the Grantham Gas Company 1015
Southampton Gas Company. 1015
The Supply of Gas and Electricity in Rome—The New Concession of the Anglo-Romano Gas Company; The Company's Annual Report 1016
Gas and Electric Lighting at Bangor 1016
Meeting of the San Paulo Gas Company, Limited 1016
Meeting of the Buenos Ayres (New) Gas Company, Limited . . 1017
The Congress of Applied Chemistry 1018
Electric Lighting Notes 1018
Commencement of the Staines Reservoirs Scheme—Cutting the First Turf. 1019
Metropolitan Water Supply Commission—Nineteenth Day . . 1019
Ipswich Corporation Water Department—Annual Report. . . 1020
Notes from Scotland 1021
Gas and Water Companies' Stock and Share List 1021
Current Sales of Gas Products 1023
Coal Trade Reports 1023

PARAGRAPHS:—

PERSONAL: Mr. W. H. Burtonshaw; Mr. F. W. Chamberlain; Mr. J. S. Naylor; Mr. H. J. Wildin; Mr. H. Simmonds . . 998
OBITUARY: M. Edouard Bengel; Mr. Percy Blakelock; Sir Vivian Majendie. 998
Forthcoming Meetings of Austrian and Bohemian Gas Associations 994
Lecture on Acetylene—The Heat of Revivification of Oxide: A Correction 995
The Manchester District Institution of Gas Engineers—Another Acetylene Company. 997
Institution of Civil Engineers—A New Incandescent Mantle. . 999
Consolidated Water-Works Company of Rosario, Limited—Deacon Waste-Water Meters at Ince 1011
A Water Scheme for Littlehampton—Antwerp Water-Works Company, Limited—The Profits of the Blackpool Gas Department—The Gloucester Corporation and the Gas Company's Bill 1013
The Lighting of the Margam District 1015
The New Water-Works for Bedworth—The New Reservoir of the Plymouth Corporation—Collapse of the Electric Light in Dublin 1022
The Water Supply at Port Erin, Isle of Man. 1023
The Supply of Water Gas at Birkenhead—Incandescent Lighting at Penzance—Gas Profits at Wigan—A Water Diviner Successful—Sales of Stock and Shares 1024
Suicide by Coal Gas—Claim as to Land Taken for the Staines Reservoirs Scheme—Explosion of Acetylene at St. Neots—Rochdale Corporation Water Supply—The Bradford Gas Suffocation Case—Concessions for Consumers of Manchester Gas—The Proposed Purchase of the Norwich Water-Works by the Corporation 1025

EDITORIAL NOTES.

The North of England Gas Managers' Association.

THE North of England Gas Managers' Association attained its majority at the half-yearly meeting which was held in Newcastle last Saturday. Though reference was made to the number of original members who are still connected with the Association, it was not forgotten that the pioneers of the movement had taken the best means for continuing the excellent work of the body by placing their younger members in the front rank. They are a shrewd class of men who represent the gas industry in the Northern Counties of England; and this is one of the most characteristic of their actions. Before retiring from active participation in its affairs, the Fathers of the Association have seen their successors installed and initiated into the work. Though a new generation will ere long hold the reins of power, there will be no need for a new policy or a new movement, or of new energy, but only a continuation of the same rapid onward march which has characterized the body all along.

Of the meeting itself, it has to be said that recollection fails to bring out of the past any one at which so much that was useful and helpful to the gas manager was before the members. Mr. Terrace's paper on carburetted water gas—being the outcome of practical experience—concentrates and solidifies much that has been floating about in a general sort of way regarding this method of producing gas. It places the system beyond that of the experimental stage, and marks the time when it can no longer be said that the carburetting of water gas has not become one of the approved processes of everyday gas manufacture. If further illustration of this were required, it is found in the circumstance that speaker after speaker, in the discussion upon the paper, either announced that he had adopted the process or was about to do so. Such an incident does not indicate a current which may be stemmed or turned aside; it is a drift which cannot be resisted. The paper by Mr. Drury, the newly-elected President, on "Methods of Raising Steam "in Gas-Works," is an example of a kind of study which is more often pursued on the Continent than in this country. It is, on the face of it, singular that the subject of cheap steam-raising should be brought forward at a technical meeting in the region of the most abundant coal supply in the world. Observation shows, however, that the quality of husbandry in industrial matters—the desire to go the cheapest way to work, and to make the most of materials—is independent of considerations of prime cost. This is a more profound truth than appears at the first blush. We remember to have read somewhere of the experiences of an inventor of some fuel-saving device, who went, as a matter of course, to the user of the most expensive coal he could hear of—thinking that here would be an eager customer for his apparatus. The result was a disillusionment. The factory owner in question, who was then buying coal for his boilers at something like £2 a ton—the locality was Italy—declined to trouble himself with the matter, on the ground that coal was so cheap! The inventor, as the story goes, then took his suggestion to a Yorkshire millowner who was getting coal at 5s. per ton delivered, and was received with the most satisfactory degree of appreciation. There is an admirable moral to this story; but we shall not insult the perspicacity of our readers by drawing it out. It is scarcely necessary to observe that the so-called utilization of the waste heat of gas-retort furnaces for the raising of steam is a very ancient practice indeed; and there are many good reasons why it has been abandoned in most modern gas-works.

Perhaps the subject of most universal importance to gas managers was that with reference to the provision which owners of gas undertakings are to make to meet their liabilities under the Workmen's Compensation Act, which will now shortly be in force. Mr. Bower deserves to be congratulated on having, as he virtually did, exposed the attempt of the world of insurance to impose burdens upon employers of industry which certainly appear more than commensurate with necessity. True, the Act is as yet untried; and while there may thus be some justification for the Associated Insurance Offices fixing high rates of premium, surely they have been badly advised if they have taken counsel only with actuaries and the like, and not with men of practice. It is surely preposterous that insurers should suggest a charge of as much as 25s. per cent. under the

new conditions; while at West Hartlepool present necessities have been met by a charge of not more than 2s. per cent. The airing of the subject should be sufficient to lead to the development of some movement for relief in this matter. In any case, it is commendable that the attention of gas managers should be directed to what must be a cause of anxiety to them in the near future. Cheap insurances would be delusive, and ought not to be entertained; but there is surely a wide field between them and what is being asked. On a subject like this, however, talking or writing will be of little avail, unless something practical is done; and therefore the North of England Association have acted rightly in appointing their officials to look into the matter, and to take part in any movement for combination which may be originated.

An Innocent Sufferer from a Gas Explosion.

Some curious reflections are suggested by the case of *Litson v. Poplar Board of Works*, decided by Mr. Justice Lawrance and a Special Jury in the Queen's Bench Division last week. This was a pendant case to other proceedings by which had been established the defendants' liability for causing an explosion of gas through the breakage of a street main under too heavy a road-roller. The plaintiff was a person of several occupations. He was a sawyer by trade, and during the best part of his lifetime he had found work at Green's shipbuilding yard at Blackwall. He also kept a tobacco-shop in the High Street, Poplar. Beyond and besides all this, the busy gentleman found time to undertake the employment of "runner" to a bookmaker who was usually to be found outside a public-house in this salubrious neighbourhood. On the fateful day, while returning from a visit to the betting professional, Mr. Litson found himself mixed up with flying flagstones of the street; there being, as he graphically described the occurrence, an explosion behind him and another in front of him. Thus there was no escape. He was not exactly "blown into the air"—which is the customary procedure in similar cases to this—but was "struck on the knee," and "dashed against the wall." The result was so much personal injury that the victim was prevented from following his useful and beneficent branch calling of bookmaker's runner, to say nothing of the sawing at Green's. Consequently, he brought an action against the highway authority responsible for the explosion. For the defence, it was contended that the plaintiff was not on the scene of the explosion when it happened, so that if he was injured at all in connection with it, it must have been by rushing in with the crowd to see what had happened. It was also pleaded that the defendants had already compensated everybody who could be supposed to have suffered from the explosion. It does not seem to have been seriously argued that to have stopped the career of a bookmaker's runner, who also kept a tobacco-shop, and possessed additional facilities for introducing his principal to a number of fellow-workmen, was well worth a gas explosion or two. A sympathetic Jury seem to have held that the sufferer was a deserving object, and awarded him £300 out of the Poplar rates by way of *solatium* for his sufferings. As the old story has it, we do not "feel equal" to expressing our sentiments in regard to this verdict, but devoutly hope there will be a new trial.

Close of the Petroleum Inquiry—The Death of Col. Sir Vivian Majendie.

The pathetic death of Colonel Sir Vivian Majendie, consequent, it has been suggested, on pressure of professional work, and over-strain brought on him in the course of his cross-examination before the Petroleum Committee, lends a touch of melancholy to the record of the witness's last recorded utterances on the vexed question of the flash-point of lamp oils. For some inexplicable reason, a section of the general and also of the technical press of this country has taken most intemperately to the view that the flash-point of the oil, and nothing else, has to do with the determination of the safety or otherwise of petroleum lamps. Violent abuse, intended to pass for argument, has been heaped from sundry quarters upon all those who have felt themselves unable to see in this simple issue the end of all questions concerning the popular use of mineral oil lamps. We do not say that this unaccountable partisanship, shown in regard to a question that would not appear to an outsider likely to arouse any such feeling, actually killed the lamented Chief Inspector of Explosives. To take this view of cause and effect in this case would be to be as one-eyed as the "high-flash" advocates themselves. But it is certain that Colonel Majendie, who evinced an awkward tendency to look at the question before the Committee from more than one point of view, was pretty severely "heckled" in cross-examination by some members who had come under the influence of "high-flash" advocates. The witness was hardly pressed to say what would be the effect of raising the flash-point of burning oils to 105°, as proposed by the London County Council; and he was unable to enrol himself among the prophets, for lack of conviction. All he would commit himself to in this regard was the general statement that, while raising the flash-point would doubtless tend to the reduction of lamp accidents, it was impossible to estimate the extent of the gain. At any rate, he did not believe it would be commensurate with the attendant disadvantages of the step. These were, so far as he could see, the effect upon the available sources of supply and on the retail price of the oil. Colonel Majendie's view, in the main, was that, before resorting to the drastic and problematical remedy of raising the flash-point, other remedies should be tried, particularly the prohibition of dangerous lamps. Before the witness's evidence on this head was completed, however, the Committee adjourned; and Colonel Majendie was fated not to meet them again. The inquiry has now been concluded; and the Committee will only meet for the consideration of their report.

The House of Lords' Judgments.

From time to time the temptation arises to those engaged in the conduct of the great national industries, to ask whether there is really any finality to litigation. Ordinarily, of course, when a question of law has been submitted to the House of Lords and pronounced upon, there is no more said. But there are some exceptions, as when a far-reaching principle of law is disclosed, it may be in regard to a dispute the merits of which were not, in the estimation of some, set out with impeccable clearness. A case in point was heard by their Lordships last week. It referred to the celebrated and momentous decision of Sir Frederick Bramwell as to the bases of valuation of tramways under the Act of 1870. It will be remembered that Sir Frederick refused to accept evidence of the value of a statutory tramway as a going concern, but valued the property for transfer to the local authority on structural considerations only. This interpretation of the Tramways Act was upheld by the House of Lords; but the London Tramways Company have tried to reopen the subject as against the London County Council. The real question last week was as to whether the House of Lords is or is not bound by its own decisions. Counsel adduced an instance where the Privy Council had reconsidered a decision, and argued that the House of Lords could do the same. The Lord Chancellor, however, in concurrence with Lords Macnaghten, James, and Morris, held that the House is bound by its own decisions on a fundamental principle of law, and cannot reverse them. This is a good thing, in the main. It is always possible to alter the law by Act of Parliament; but there is a manifest advantage to the community in knowing that, when once their Lordships, who constitute the Supreme Court of Justice for the realm, have declared what the law is, they will on no account go back upon their judgment.

The South Wales Colliers' Strike.

There are no fresh developments of the South Wales colliers' strike to record this week. The lesson that has lain on the surface of all recent industrial troubles appears to have been apprehended at last in this connection; for one does not hear of would-be conciliators rushing forward with the hope of gaining cheap fame by composing a quarrel in which they are not concerned. It is impossible to avoid the opinion that there is a good deal of "make-believe" about the men's position and attitude. On the other hand, the case of the employers seems to possess a coherence and strength that augurs well for the eventual settlement of the dispute in accordance with their views. The coal-owners will have no half-measures for dealing with the trouble. They will not treat with so-called representatives of the men who might play fast and loose with their credentials, as it suited their purpose; and they will not fall into the open snare of treating the exceptional market conditions created by the strike as normal to the trade. That there is much local distress, especially among the working-class population of the towns that depend upon

the staple industry of the region affected, is unfortunately undeniable. When the collier plays, it is the dock labourer who pays. The issue at the present moment is as much a question of management as of wages. In some degree, it is Bethesda over again. The coalowners complain that the present trouble has been caused entirely by the workmen having put an end to the old sliding-scale agreement without taking sufficient thought for anything to replace it. Consequently, when the men's notices expired, there was no organization of the men with which the employers could deal, with a view to the restoration of the *status quo* or anything else. When the time for making a fresh agreement arrived, the men were found quarrelling with their representatives and among themselves, instead of being prepared with machinery needful to procure a settlement. The bulk of the colliers are reported to be starving; yet they will not go back to work on terms upon which they could earn from 5s. 6d. to more than 10s. per day. For the moment, the practical interest is concentrated upon the negotiations between the mine enginemen, the stokers, the fitters, and the coalowners. If these men go out, the mines will in many instances be flooded, with disastrous results. Some of the older and less remunerative pits, once closed to work, would never be opened again. The engine-drivers and pump-fitters have applied for an advance of wages; and this has in principle been conceded by the employers. Upon the exact figure, however, there is disagreement. The employers, through Sir W. T. Lewis, have offered an advance of 3·16 per cent., which the men regard as being inadequate. It remains to be seen whether the employers can "spring" anything upon their offer; or whether the men will take what they can get. Meanwhile, it may be suggested to the colliers working in other fields, who are naturally disposed to make the best of the South Wales trouble as a help to the improvement of their own position, that the whole business may collapse at any moment, and cannot in any case last very long.

The Truck Acts and Works Benefit Clubs.

It seems passing strange that such questions as those asked in the House of Commons last Friday by Mr. Mendl and Captain Chaloner with regard to the scope of the Truck Acts, should have been reserved to the present day. Mr. Mendl inquired of the Home Secretary whether his attention had been drawn to various cases in which one of the conditions of employment was contribution to a shop club or benefit society in connection with the works; and also whether such condition was lawful having regard to the provisions of the Truck Acts. Following on the same lines, Captain Chaloner wanted to know whether the Home Secretary would endeavour so to amend the Workmen's Compensation Act, 1897, as to render it illegal for employers of labour to compel their employees to join a works club as a condition of hiring, or to cease their membership in any friendly society to which they might belong. Sir M. W. Ridley admitted having received representations on this subject, but said he was advised that "there "is nothing in the Truck Acts or elsewhere to make such "a condition of employment illegal." Though late, this declaration is to be welcomed. Continuing to reply to Captain Chaloner, the Home Secretary remarked that the suggestion of the honourable member, even if practicable in itself, which he doubted, "could not be carried out by "an amendment of the Workmen's Compensation Act, "which does not deal with the law of clubs or of friendly "societies, but merely provides that such a condition "should not be comprised in any scheme approved by the "Registrar under the Act." The latter part of the answer is thoroughly official, not to say perfunctory. The purport of the questions put is perfectly obvious. They arise from Trade Union instigation, with which the inclinations of some unprogressive employees happen to coincide. On more than one occasion, the suggestion that mutual benefit funds, or profit-sharing, might very well be introduced into particular industrial establishments, has been met by headquarters with the objection that it was doubtful whether all arrangements of the kind were not illegal, having regard to the Truck Acts. And since every provision of the kind is looked upon with implacable hostility by the Socialistic Trade Unions, it is not to be wondered at that the development of such schemes has been slow in this country. Perhaps this slowness has not been an unmixed evil, seeing that, notwithstanding the uncertainty that has prevailed as to the scope and meaning of the Truck Acts, a number of experiments of the nature here indicated have been inaugurated and persevered in. Yet there is ample room for more, and more varied, endeavour in the same direction; and now that one theoretical obstacle to such development has been shown to be non-existent in fact, it may take a fresh start.

WATER AND SANITARY AFFAIRS.

Interesting statements of the views of the Corporation of the City respecting the purchase of the Metropolitan Water undertakings were made before the Royal Commission last week by Mr. Goldney, the Remembrancer, whose cross-examination was then resumed. It was thus stated that though the Corporation considered a special Court would be necessary in order to deal with so large a question as the purchase of the London Water Supply, they did not expect to get the undertakings of the Companies on any other than fair terms. They never contemplated using control for the purpose of knocking down the value of the Water Companies' shares; neither did they believe that Parliament would impose such conditions in respect to arbitration as would unfairly reduce the price of the undertakings. So much being said on that side, Mr. Goldney had something to say which went in another direction. There was no notion of paying 10 per cent. for compulsory purchase. If purchase had to take place under the Lands Clauses Act, the Corporation came to the conclusion that it would be financially "inexpedient." They considered the terms would then run so high that the price of water in the City would inevitably have to be increased. There was also the effect previously referred to—namely, that if the water-rates were made uniform throughout London, the City would lose the benefit of the arrangements with the New River Company, by which the City consumers were largely exempt from the rule of rateable value. This latter objection would apply to any form of purchase; and a very ominous conclusion indeed furnished the *finale* to Mr. Goldney's evidence—the words being simply: "A price "perfectly fair to the Water Companies might be such as "would not warrant purchase in the interests of the City." But let the price be ever so moderate, the City would still suffer by the equalization of the water-rates, seeing that the charges would be affected by a process of "levelling up."

Sir Arthur Arnold succeeded Mr. Goldney as a witness before the Commission. The ex-Chairman of the London County Council spoke of the negotiations which he conducted two years ago with the Water Companies for the purchase of their undertakings. He was very favourably impressed by his interviews, and believed in the possibility of terms being settled between the Council and the Companies. But Sir Arthur was rather an awkward witness, for while he was able to tell the Commissioners what he said to the Companies, he felt bound to secrecy with respect to what the Companies said to him. Mr. Pember, who for the time being represented at least seven Companies out of the eight, gave Sir A. Arnold full liberty of speech. But this failed to unlock the lips of the oracle; Sir Arthur persistently pleading that the statements made to him were confidential. Viscount Llandaff seemed to consider that the oracle was dumb because it had nothing to say. Sir Arthur, he understood, went into these negotiations without any instructions as to what terms he should offer or accept. Witness owned that this was the case. The Chairman of the Commission then wished to know, as a man of business, of what use was this palaver, in which "nothing was "suggested, nothing proposed, nothing accepted, and "nothing settled." Sir Arthur met this somewhat sharp criticism in a way which may be taken as valid. The "conversation" produced on his mind an impression that if an Act of Parliament were obtained which authorized purchase, there would be no substantial difficulty in coming to an agreement. He had acquired proof that the Water Companies were not impracticable or irreconcilable. They were willing to sell, if reasonable terms were presented. They were not defiant, nor, on the other hand, were they stupid. After all, nothing came of it. So also between the City Corporation and the New River Company there appear to have been, at a somewhat remote period, "conversations of a personal character," in the nature of "feelers," hardly coming up to the status of negotiations. Purchase must have been aimed at; but nothing was accomplished. What are we to learn

from facts like these, only dimly disclosed even now? We can but conclude that the purchase of the water undertakings is too big a mouthful for either the Corporation or the County Council. They can only nibble at it, or play about it; and while the Companies are—in a certain measure—willing to sell, the Authorities are not prepared to buy. The absurdity of the situation consists in the readiness of the Council to spend millions in order to bring a supply from Wales, while all the millions which represent the value of the existing works remain to be dealt with.

Sir A. Arnold considers the present system of control—we might say supervision—with respect to the London Water Supply is not sufficient to secure the purity of the water. It is interesting, and perhaps important, to see what better means Sir Arthur is prepared to introduce. It is simply that he would place all in the hands of the County Council; leaving them to supply pure water "according to their judgment and their lights." If any consumer finds his supply turbid, to whom is he to complain? To the County Council, who will thus be called upon to pronounce judgment upon their own doings. The Council, as the representatives of the people, "may be "trusted." This is just the difficulty which presents itself supposing the water supply of London to be absolutely possessed by the County Council. The Local Government Board may control the Water Companies; but what authority will be in a position to control the Council? Sir A. Arnold denies that the Council is swayed in any degree by politics or partisanship; and he expresses his opinion that it is almost an ideal collection of men for a municipal body. If London is favoured with a ruling power possessing such ideal excellence, of course everything may be confided to it. This transcendent quality is apparently assumed as belonging to the County Council; and hence their disposition to claim that they could do everything better than anybody else. At all events, the City fails to see it.

The Commissioners have now sat for twenty days, and the end of the inquiry is not in sight; nor is the question of the future control of the Metropolitan Water Supply any nearer a settlement. In the meantime, those who are responsible for this important public service are not relaxing their efforts to make it as efficient as possible. Ample evidence was afforded of this last week. On Monday, the Bill promoted by the Staines Reservoirs Joint Committee for the amendment of their Act of 1896 so as to allow of the enlargement of a reservoir—thereby increasing its storage capacity—and for obtaining sanction to the raising of £250,000 of additional debenture stock, passed successfully through Committee; and later in the week, the Bill of the Southwark and Vauxhall Water Company, to authorize the construction of works and the abstraction of more water from the Thames, was under consideration. On Saturday, as recorded elsewhere, a formal commencement was made with the gigantic scheme of reservoirs at Staines above referred to. The ceremony of cutting the first turf was performed by the Chairman of the Joint Committee (Mr. Edmund Boulnois, M.P.), in the presence of his fellow-members and a thoroughly representative gathering, and under meteorological conditions which, if the comparison may be excused, did not altogether inaptly represent the varied opinions held in regard to the Metropolitan Water Supply. It has of late years had to bear the strong wind of adverse criticism; but, on the other hand, this has been tempered by the warm support of those who well know that the Directors of the London Water Companies are conscientiously doing their best with the undertakings entrusted to them. We cordially join with those present at the ceremony on Saturday in wishing success to the scheme just inaugurated. If engineering ability combined with exceptional skill in the carrying out of works of this character can secure it, that success is assured. We trust that a few years will see the completion of this section of the work.

Forthcoming Meetings of Austrian and Bohemian Gas Associations.—The annual general meeting of the Association of Gas and Water Engineers of Austria-Hungary, of which Herr H. Nachtsheim is President, will take place from the 5th to the 8th of June, in Vienna. The Association of the Gas and Lighting Industries of Bohemia will hold their annual meeting at Carlsbad on the 15th and 16th inst. The President is Herr J. Moll, Manager of the Eger Gas-Works; and the meeting is held at Carlsbad through the co-operation of Herr G. Häffner, the Manager of the local gas-works.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 1021.)

A GREAT change came over the Stock Exchange last week. The rally in prices was something almost surprising, so sudden and complete was it. The key to the movement was the condition of the Money Market. The apprehension that, with the actual outbreak of war, money would immediately become dear, proved to be quite unfounded. There was no run on gold, loanable money was most abundant, and discount rates eased down materially. So prices all round had a nice recovery. Business, however, was decidedly limited in volume, and caution is still the order of the day. An unsavoury incident of the week was the "Bottomley smash," resulting in the hammering of nine members, and much distress in other quarters. Business in the Gas Market was very quiet; transactions being more than usually restricted. Prices on the whole were not particularly good; but there was little perceptible movement in them. Hardly any changes in quotation took place; and they are almost wholly confined to the issues of The Gaslight and Coke Company. Gaslight "A" opened unchanged, and was done at about 285 every day, remaining steady until near the close, when it drooped a little, and so was put down a couple of points. Hardly anything was done in the secured issues, except "H" limited; and this remained steady. The 10 per cent. and 6 per cent. preferences were, however, freely lowered without business done in them. A moderate amount was transacted in South Metropolitan at the old figures, without any sign of a change. There were a couple of transactions in Commercial old at the closing prices of the previous week, after which the quotation was opened out to a 15 per cent. range. There appears to be a tendency towards this sort of thing in the market now; and the public are not likely to view it with favour. Not a single transaction was marked in any of the Suburban or Provincial Companies; and there was no change in price. Business was extremely quiet in the Continental group; the general tendency appearing to be in favour of steadiness. None of the rest gave any sign or made any movement. The Water Companies were as quiet as ever; business being of the most limited character. Prices rather tended downward; and here, as in Gas, the secured issues were the chief sufferers.

The daily operations were: There was no animation in the Gas Market on the opening day; and business remained very limited. Gaslight "C," "D," and "E" fell 1. Things continued to be much the same on Tuesday; and Gaslight "K" receded 2. Wednesday brought about no greater activity; and quotations closed unaltered. The few transactions recorded on Thursday were at unchanged figures; but the quotations of Gaslight "C," "D," and "E," and ditto "J" were 1 lower. Friday was as quiet as any day in the week. Gaslight preferences again fell—"C," "D," and "E," and "J" and "K" losing 2 each. In Water, Grand Junction debenture fell 3; and Southwark debenture, 2. Hardly anything was done on Saturday; but Gaslight "K" fell 2.

ELECTRIC LIGHTING MEMORANDA.

An Exposure of "Progressivism" in Regard to Vestry Electric Lighting—The Cases of Hackney and Fulham—What Price?

IT is high time that the attention of the public was drawn to the insidious growth in English Municipalities, more especially in that artificial semi-municipal, semi-political region dominated by the London County Council, of a style of treating questions of local administration which is fraught with the worst kind of danger to the commonwealth. Generally, this consists in systematically dealing with matters of local business, not upon their merits, but wholly or solely as they may be regarded to agree or to be in conflict with certain preconceived lines of "policy." Particularly, it also consists in the violent attack or defence of proposed administrative acts in the name of certain shibboleths, behind which it is often easy to discover some party or private interest. There is nothing new in this evil. Most evils of the body politic are hoary. The policy of doing nothing, and calling it prudent and economical administration, was practised long before there was known to be a Moderate party in local government affairs. Similarly, the trick of bounce and bluster and claiming sole possession of all the public virtues, while retaining a little private business to be done round the corner, was familiar to politicians when there were no Progressives in the land. Old ways of humbugging the public persist, though they are obligingly called by fresh names every generation or so, lest the half-educated electorate should discover the nature of the game before the stakes are collected. Nowadays the simple are beguiled by wild and whirling talk about "Democracy," "Progressivism," and other catch-words which a trashy and not always independent Press keeps constantly in type. There is little harm in this flood of "bunkum" so long as its motives are mere abstractions. Fulsome laudation of a contemporary

politician, or political party, couched in the cheap catch-words of the hour, may nauseate the judicious; but if it sells the paper, the main object is attained.

It is when the abstractions of political opinion are replaced by concrete measures that the hectoring dictation of the soulful Progressive politician, through the agency of the platform or the newspaper, becomes a pernicious nuisance in local government, An example in point is supplied by recent performances of the journal styled "London" with regard to certain electric lighting proposals concerning the parishes of Hackney and Fulham. Let it be understood that the catch-words "Municipalism" and "Monopoly" are words to conjure with in the Progressive vocabulary, and that when one wishes to prejudice the acts of a party or individual in local administration with the public that gets its opinions on such matters ready made at local political clubs, it is only necessary to use the terms "anti-municipal," "reactionary," "traitors," "jobbery," and so forth, to taste. Your true Progressive likes to lay it on thick when he starts to manufacture this kind of "public opinion." Consequently, in a couple of pages of "London" for the 7th ult., bearing the attractive heading "Monopoly on the War-Path—A Hackney Job," we find all these flowers of Progressive oratory, and more, lavished upon the "disgraceful proceedings" of the Vestry in regard to a proposal "to hand over their valuable Provisional Order for electric lighting to a company," including the boon of the dust-collecting and refuse-destroying work of the parish. It is agreeably stated that "deliberate attempts have been made on the part of the agents of monopolists to bribe vestrymen; and about half the Vestry have gone back on municipal control." Here is an imputation that whosoever, being a Hackney Vestryman, holds the opinion that it would be expedient that a particular course should be followed in regard to the electric lighting and dust collection of the parish, is a venal person who has sold his trust. Indeed, a special list of "Progressive Traitors" is given, containing ten names. Encouraging, this, for plain citizens with hides of the normal thickness to come forward and serve their fellow-ratepayers in the management of parish business!

However, there it is. The Progressive drum is banged. Local political clubs of sympathetic brand are moved to convene meetings for the purpose of passing resolutions to terrorize the Vestry into adopting a particular solution of a practical question. Whoever does not see the wisdom of this course is howled at, held up to ridicule as a fool, his motives impugned, and his name pilloried. And what is it all for? Simply that in 1895 Mr. F. H. Medhurst recommended the Hackney Vestry to embark upon a combined electric lighting and dust destruction scheme which he estimated would cost about £80,000, and would, of course, return a handsome profit. It is no disparagement of Mr. Medhurst or his class to remark that one has heard of many such estimates. The Hackney Vestry took this particular effort into consideration; and as the result of much excogitation and inquiry, a Committee of the Vestry recommended that the offer of the Electric Traction Company to supply electricity and do the dust collection and destroying for the parish should be accepted, instead of the Vestry making the venture directly. The reason for this decision is stated in the Committee's report. It is that to carry out such a business successfully "would have demanded special technical knowledge on the part of some members of any Committee appointed for the purpose, and the taking of a serious responsibility on the part of the Vestry, which, in the experience of London Local Authorities acting under their Electric Lighting Orders, *has not been so far financially to the interests of the ratepayers.*" This judgment "London" denounces as "absurd," and calls those who delivered it every vile name—on its faith, apparently, in Mr. Medhurst. Curious to relate, the same uproar is raised about a similar "deal" proposed for Fulham; and here again it is Mr. Medhurst's ingenious demonstration of the economical character of dust destructors and parish electric lighting that has failed to convince the Vestry that here is the real Klondike. Strangely enough, in one page "London" is all for parochial electric lighting for Fulham, and in the next the existence of "grave parochial scandals" is alleged of the same locality. If only half of what is asserted in the latter respect is true, the Vestry is not fit to be trusted with the management of a single dust-cart, to say nothing of a Medhurst combination such as "never lived except in dreams, nor shone—except on paper." Here we have two examples of would-be up-to-date Progressivism, as represented by its choicest journalistic flower, in full blast. What can one think of the spectacle? Could it be wondered at if some of the incriminated Hackney and Fulham vestrymen—honest souls, doubtless, but a little rough of speech—were to turn on their aspersors; and inquire, in the vernacular, "What price that lot?"

THE PROSPECT OF CHEAPER ELECTRICITY SUPPLY.

It is possible that some friends of the gas industry of the United Kingdom may be looking with a little anxiety upon the proposals that are now being made for establishing, in certain industrial centres, works for the generation and distribution of electricity on the largest scale. In connection with these schemes, it has also been promised that the manufacturing districts are on the eve of experiencing a revolution in the method of distributing power in factories. Everything is going to be done by electrlcity; and in the course of a year or two mill shafting and belting are to be as rare as gas-burners! Mr. Raworth recently gave a suggestive address on some of these aspects of the supposed immediate future of industrial electricity supply. We have also referred, not unsympathetically, to the possible services that electrical power might render to the South Staffordshire region, if the supply could be laid on at the price of 1d. per unit. It is fair to say, however, that the prospects of this great expansion of the application of electricity to industrial purposes have been unfavourably commented upon by impartial critics, more especially the "Engineer." Our staid technical contemporary can usually be trusted to pour cold water on any would-be innovator in engineering; and this time it appears to enjoy the task of demonstrating that there is not going to be any such revolution in British factory practice as Mr. Raworth promised.

The demonstration proceeds upon the basis that all industrial developments of electrical engineering must be subject to the same commercial test that has operated in regard to the lighting branch. It is admitted that the true reason why the electric lighting business has grown so slowly in this country is the generally low price of gas. This is a good deal for an electrician to confess; but having done so, it is the natural consequence for him to recognize the same kind of competition in other fields of enterprise. Thus, Mr. Arthur Herschmann, speaking of cotton-mill driving, declares that for this purpose shafting "requires a good deal of beating" at the hands of the electrical engineer. "Modern competition compels the cotton spinner to manufacture in big quantities, and to concentrate production with a view to economize general establishment charges. This places him in a position to employ large engines as prime movers developing 1-horse power for, say, 2 lbs. of coal (which latter, by the way, is cheaper here than abroad), and makes him a bad customer to be approached by any electric power supply company that may work in his neighbourhood." Mr. Herschmann goes into details, and these lead him to the conclusion that, while there may be industries where electric power will be found advantageous, this is not the case of the cotton-mill.

It is argued by the "Engineer" that the cost of generating and distributing electrical power from a great central station in the coalfields would be considerably more than £4 per horse power per annum. There are no data available to show what the cost would actually be. At the suggestion of every new application of electricity to an industrial purpose the question of expense appears. Whatever may be pretended, as our contemporary observes, "it is known very well that, as matters stand, electricity is costly. It is only under very peculiar circumstances, with which the general public have little to do, that it can be obtained for less than 5d. per unit; a higher price is the rule. Mr. Raworth's anticipations are based on a rate very much less than this. We have heard similar arguments before. They all come to the same thing in the long run. . . . Electricity is an admirable servant, and is popular accordingly; but, like most other good servants, it is very expensive. For about twenty years we have been told that its cost is to be reduced next year. The reduction has not come yet; and the worst of the matter is that all the large producing companies, who ought to know—and who are for the most part keenly competitive—tell us that they see no prospect of being able to reduce the price." This appears to be the bottom fact of the situation.

Lecture on Acetylene.—A lecture on "Acetylene" was delivered at the Battersea Polytechnic, on Saturday, the 23rd ult., by Dr. W. A. Bone, the Chief of the Chemistry Department. The lecture (which was fully illustrated by experiments) dealt with the manufacture of calcium carbide and the production of acetylene from it. The value of acetylene as an illuminant was discussed; and the explosive character of the gas, especially when mixed with air or oxygen, was demonstrated. There was a crowded audience; and the interest shown in the subject was manifest from the fact that many people were unable to gain admission.

The Heat of Revivification of Oxide: A Correction.—A correspondent has kindly drawn our attention to an error in the figures given in the article on "The Heat of Revivification of Oxide" in the "Journal" for Feb. 15 (*ante*, p. 338). The weight of water equivalent to the revivified mass from 100 parts of prepared bog oxide should be 75·11 parts in place of 85·11 parts, or, after allowing for the evaporation of free water, 56·92 parts in place of 66·92 parts. The rise in temperature is 120·7° C., in place of 102·7° C. The temperature that is finally attained by the revivified mass is therefore 277° Fahr., in place of 245° Fahr. as stated at the conclusion of the article. Our correspondent pertinently adds that the correction "still further emphasizes the importance of sprinkling water upon the oxide spread out on the revivifying-floor, to guard against a dangerous rise of temperature during the process." The correction does not affect the conclusions drawn in the "Journal" for April 19 (p. 878) as to the thermic effects of revivification of Weldon Mud and oxide. If evaporation of water did not occur during revivification, the temperature of the revivified mass would be about 675° Fahr. in the case of oxide, and about 640° Fahr. in that of Weldon Mud. We were quite right, therefore, in drawing the conclusion that the "thermic effects (of revivification) are about the same with the two materials," when the active materials are present in the customary proportions.

THE STAINES RESERVOIRS SCHEME.

It will be seen, by a report which appears in another column, that a commencement was made last Saturday with the scheme of storage reservoirs which it is proposed to carry out in the neighbourhood of Staines, under powers granted by Parliament in 1896. In view of the magnitude of this projected addition to the works at present furnishing the Metropolis with its supply of water, it may be of interest to trace the steps by which the original suggestion has been brought into the way of becoming an accomplished fact.

The scheme owes its origin to Mr. Walter Hunter, M.Inst.C.E., one of the Directors of the Grand Junction Water Company. In his capacity as a Director of a London Water Company, and also as a member of the Lea Conservancy Board, Mr. Hunter had, of course, closely studied the water question. He had been very much struck with the small percentage of water drawn from the Thames, as compared with that taken from the Lea; and his investigations led him to the conclusion that the capacity of the former river for the water supply of the Metropolis was misunderstood and greatly undervalued. The average quantity taken from the River Thames was about 90 million gallons daily, while the average flow was about 1350 million, and the maximum flow about 20,000 million gallons daily. It seemed evident, therefore, that a large additional quantity could be drawn from the river if a proper system of reservoirs were constructed. A development in this manner of the natural water supply of London appeared, upon the face of it, to be much less costly than bringing water from a distant source. Moreover, the system possessed the great advantage of being readily constructed in instalments, as rendered necessary by the additional demand for water, caused by the actual instead of estimated increase in the population. Mr. Hunter read to his colleagues a memorandum describing the general character of his proposals. They approved his scheme and instructed their Engineer—the late Mr. A. Fraser, M.Inst.C.E.—to assist him in developing a definite scheme for their consideration. From his knowledge of the Thames Valley, Mr. Fraser was able to point out where the proposed reservoirs could be economically constructed.

After mature consideration, Messrs. Hunter and Fraser, in September, 1892, presented to the Directors of the Company a report in which it was proposed to construct nine reservoirs, each of 2000 million gallons capacity, capable of ensuring an average daily supply of 300 million gallons, while securing a minimum flow of 200 million gallons at Teddington. The intake of the river was to be above Bell Weir, and the water was to be pumped into the reservoirs and conveyed, either from the reservoirs or direct from the intake to the works of the Companies at Hampton through a close cast-iron conduit laid in the clay. Those of our readers who have followed the progress of the Metropolitan Water Question during the past few years will, of course, remember that the scheme was laid before the Royal Commission on Water Supply of 1892-3, presided over by Lord Balfour of Burleigh, and its details were explained by the above-named gentlemen.

Mr. Hunter said the first four of the proposed reservoirs would be north of Staines; three others would be south of the main road between Staines and Hampton; and two others, which it was proposed to construct last, would be at Wraysbury. The depth of the reservoirs would be 40 feet. The water would flow in by gravitation up to 10 feet, and the rest would have to be pumped. The scheme would provide storage for four months of drought and fifteen days of flood—assuming that the flood came immediately after the drought; but the worst water would be allowed to go. They calculated that there would be an ample flow in the river, in the most unfavourable year without taking in flood water. Giving some further details, he stated that of the 433 million gallons of water per day which was the maximum quantity likely to be required for the supply of the population of London up to the year 1941, they could reckon upon obtaining 153 million gallons from the Lea, the New River wells, and other sources; leaving 280 million gallons a day as the quantity required from the Thames. By the scheme submitted, they would be able to get 300 million gallons; and its total cost, with pumping-engines, &c., would be about £5,391,000. Mr. Hunter was asked, supposing the projected reservoirs were constructed now, what would be the effect upon the Thames. He replied that there would not be any special effect, as there would always be left in the river as much water as the Conservators of the Thames desired to have. He concluded by expressing his strong opinion that, looking at the matter from the points of view of the general public, the London County Council, the Water Companies, and the consumers, it was desirable and necessary that the Thames and the Lea should be utilized to the utmost extent before recourse was had to any other watershed. He thought the Lea was at present proportionately much more used than the Thames, and that the energies of the Water Companies should be given more to the larger river.

Mr. Fraser, who had prepared the estimates for the scheme in conjunction with Messrs. John Aird and Sons, followed. He stated that there was a depth of from 20 to 30 feet of ballast and sand over the area of the proposed reservoirs—something like 2000 acres; and at the bottom was the London clay, down to which they purposed digging. When the reservoirs were completed, the water could be made to flow through all or any series of them down into the culverts, and so be kept moving. They did not propose to make any compensation for the abstraction of the water; but they had provided for a minimum flow of 200 million gallons a day over Teddington Weir. It was intended at first to use the existing filters; but if additional ones were required, they could be constructed in the neighbourhood of the new reservoirs, where there was a very favourable place. The cost of the reservoirs, including the land, would be equivalent to about £180 or £190 per million gallons.

The foregoing is an outline of the Messrs. Hunter and Fraser's scheme. As it was only one of several laid before the Commission, we will see what was thought of it by two eminent members of the engineering profession—the late Mr. Thomas Hawksley and Sir Frederick Bramwell. In a report made by them they testified in general terms their approval of the proposal. They expressed the opinion that the sites suggested for the reservoirs were suitable, and that they could be constructed at a moderate expense. They thought the project showed "that the watershed of the Thames affords ample facilities for increasing the supplies of water to the Metropolis when and as they may be required." The Royal Commission were very favourably impressed with the scheme, which, without committing themselves to details, they said commended itself to them as "the best which had been suggested." They laid emphasis on the points that it affected but a short run of the main river, and none of the tributaries; and that it could be carried out by easy stages as the demand for water grew, or be delayed or stopped entirely, as circumstances might dictate in the future. They considered the sites selected to be quite unobjectionable from a geological point of view, lying as they did on the alluvial plain of the river, with a gravel bed beneath, and the thoroughly impermeable London clay, which would form an entirely satisfactory bottom for the reservoirs, below.

The scheme had the approval of the London Water Companies, all of whom, with the exception of the Kent Company, it was originally intended to serve; but the difficulties of various kinds prevented the adoption of an agreement between them to carry out the works. In August, 1895, however, Mr. R. E. Middleton, M.Inst.C.E., an Assistant Commissioner to the Royal Commission of 1892-3, was associated with Messrs. Hunter and Fraser; and the three Engineers were instructed to prepare a scheme for Parliament for consideration by the Chairmen of the Associated Water Companies. Shortly afterwards—on Oct. 6, 1895—Mr. Fraser died; and the preparation of the scheme then devolved upon Messrs. Hunter and Middleton. Mr. Middleton accepted generally the original scheme, but proposed that the reservoirs should be made almost entirely by banking, and that an open instead of a close conduit should convey the water to the sites of the reservoirs and to Hampton; the water being pumped from the open conduit into the reservoirs, as had been proposed to be done from the close conduit under the original scheme. Mr. Middleton's proposal possessed the advantage of avoiding the friction of the close conduit, and of delivering the water at such a level at Hampton as would command the works of the Companies on both sides of the river. It was, however, found to be impracticable to carry out a general scheme; but the New River, the West Middlesex, and the Grand Junction Companies, anxious to adopt the recommendations of the Royal Commission, agreed, in October, 1895, to undertake the scheme upon a modified basis; and Messrs. Hunter and Middleton were instructed to prepare plans for submission to Parliament in the session of 1896. Mr. Middleton's modifications were adopted, and the scheme took its present shape. In November, 1895, notice was given of the intention to promote a Bill to sanction the formation of a Joint Committee, composed of representatives of the Grand Junction, New River, and West Middlesex Companies, with a standing Arbitrator, to acquire lands, and to make and maintain certain works. The latter were specified as follows:—

Two reservoirs (Nos. 1 and 1A) to be situated wholly in the parish of Stanwell; a reservoir (No. 2) in the parish of Hampton; a pumping-station in the parish of Stanwell; an aqueduct or conduit commencing in the parish of Wyrardisbury, in Bucks, by an intake from the north side of the River Thames, about 250 yards westward of the Bell Weir, and terminating in the parish of Hampton, at the south-west corner of the proposed reservoir No. 2—passing in its course through Wyrardisbury, Staines, Stanwell, Ashford, Laleham, Littleton, Sunbury, and Hanworth; an aqueduct, conduit, and line of pipes (No. 2) wholly in the parish of Stanwell, with a short line of pipes (No. 2A) to connect this aqueduct with the reservoir No. 1A; an aqueduct or line or lines of pipes (No. 3) wholly in the parish of Stanwell, with a short pipe-line (No. 3A) to connect it with the reservoir No. 1A; an aqueduct or line of pipes (No. 4) in the parish of Hampton, commencing at the intended reservoir No. 2, and terminating in the pumping-well at the West Middlesex Water Company's works at Hampton; an aqueduct or line of pipes (No. 5) also in Hampton, commencing at reservoir No. 2, and terminating in the property of the Grand Junction Water Company; an aqueduct or line or lines of pipes (No. 6) commencing in Hampton, passing through Sunbury, and terminating at West Molesey, in the subsiding reservoir on the works of the Chelsea Water Company; an aqueduct, conduit, or line of pipes (No. 7) wholly in the parish of Wyrardisbury, commencing in the Colne Brook, and terminating by a junction with the intended aqueduct No. 1; an aqueduct or conduit (No. 8) wholly in the parish of Staines, commencing by a junction with the Wyrardisbury River, and terminating by a junction with the aqueduct No. 1.

The Bill as deposited specified that the necessary lands and easements were to be acquired within seven years after it was passed; and that the two reservoirs in the parish of Stanwell, together with sundry accessory works, should be completed within ten years. The Joint Committee were to be empowered to appropriate the waters of the River Thames, the Wraysbury River, and the Colne Brook; subject to the provision that the flow of the Thames was not to be reduced to less than 250 million gallons per day at Bell Weir. The funds for carrying out these works were to be raised by the creation of "Staines Reservoirs Guaranteed Debenture Stock" to the nominal amount of £1,000,000 sterling, bearing 3 per cent. interest. For this money the Joint Committee primarily, and afterwards the Companies, separately or together, were to be held responsible. The working expenses and capital charges of the Committee were to be defrayed by the Companies in proportion to the quantity of water taken. The Bill was referred to a Hybrid Committee, presided over by Sir Joseph Pease, appointed to consider the London Water Bills of that session; and, after an inquiry extending over several days, it was passed. In its progress through Committee the minimum quantity of water to flow over Bell Weir was raised to 265 million gallons; and the Act specified that no water should be taken from the other streams when the flow over the Weir was below this quantity. Not more than 100 million gallons of water were to be taken from the Thames, nor more than 35 million gallons delivered to the three Companies on any day, except in cases of emergency, when the latter quantity might be increased to 45 million gallons. All the works authorized by the Act were to be completed within seven years. The Committee were to pay to the Conservators of the Thames a sum of £5000, to be applied to any purpose arising in consequence of the Act; and also to make a yearly payment of £2500 to be placed to the Upper Navigation Fund. Stock to the nominal amount of £1,000,000 was created; the first portion whereof (£250,000) was issued on July 21, 1897, at an average price of £103 16s. 9d. per cent. The total amount applied for was £369,700—nearly 50 per cent. more than was offered. The payment of the interest is guaranteed by the three Companies represented; and the stock is redeemable after 25 years from the date of issue, subject to six months' notice. The Committee are in Parliament this session with a Bill to amend their Act. Two of the reservoirs are to be enlarged, and some additional lands acquired. The nominal amount of the debenture stock is to be increased to £1,250,000; and trustees are to be allowed to invest in it as though it were the stock of the Companies constituting the Committee. This Bill, as will be seen by our "Parliamentary Intelligence," has passed the Committee stage and been reported.

The foregoing is a sketch of the history of this important undertaking—the outcome of the co-operation of two able men, each possessing special knowledge which made them complementary one to the other. It is regrettable that one of them should not have been permitted to witness the first step taken in the direction of putting the project into practical shape. The other, however (Mr. Walter Hunter, who has since become the Engineering Director of the Company with which they were both connected, and in that capacity is responsible for the whole of the engineering department), is Joint Engineer with Mr. Middleton to the Staines Reservoirs Committee; and the designs, estimates, and contracts for the scheme have been prepared under their joint responsibility. The Chairman of the Committee is Mr. Edmund Boulnois, M.P., Chairman of the West Middlesex Water Company; the Deputy-Chairman being Sir Joseph Savory, Bart, M.P., of the New River Company. The three associated Companies are represented as follows: Grand Junction, Messrs. C. Horsley, H. Mott, and F. Tendron; New River, Sir J. Savory, Bart, M.P., and Messrs. A. Johnston and A. R. Prideaux; West Middlesex, Messrs. E. Boulnois, Jackson Hunt, and J. Miles. The Secretary is Mr. F. H. Wybroo, the Secretary of the last-named Company; and the Solicitors are Messrs. Hollams, Sons, Coward, and Hawksley.

COKE-BREEZE CONCRETE BUILDING CONSTRUCTION.

The subject of fireproof building construction has usually been considered chiefly in connection with buildings other than the small dwellings in which the bulk of the population live. Fireproof construction as supplied to domestic buildings has been little regarded, either by fire insurance companies or local authorities, apart from the elementary regulations applying to party walls and chimney-flues appearing in local Building Acts. Consequently, Mr. Thomas Potter had almost a fresh topic upon which to discourse recently to the Society of Arts, when selecting for the title of a paper "The Fireproof Construction of Domestic Buildings." Yet it is obvious that, in the aggregate, the risk of fire involving loss of life through want of fireproof construction is greater in regard to private dwellings than with any other buildings. The fact that the premium of insurance for brick-built, slate-roofed private houses is so low, has helped to obscure the truth that the tale of loss of life and property ensuing upon fires occurring in such dwellings is really a heavy one. When attention is drawn to the returns of fires in the domestic buildings of London (say) for even a single year, the gravity of the matter becomes apparent; and it is only natural to ask whether something cannot be done to lessen the evil. Mr. Potter declares that it is greatly due to the flimsy and combustible character of the building construction. "If as much care had been bestowed in the past, and was still practised, to make our houses fire-resisting, as has been expended in extinguishing fires, there would be comparatively but few serious fires at the present time or in the future, so far as domestic buildings are concerned. . . . The majority of buildings are allowed to be built to burn, except so far as regards external walls, chimneys, party walls, and roof coverings."

Of course, the source of this mischief is the cheap, soft wood supply of the United Kingdom. It is really terrible to think how much of this highly inflammable deal timber goes to the construction of an ordinary house. A journey into one of the Mediterranean countries is requisite to open an Englishman's eyes to the extent to which this cheap timber has reduced the use of bricks and mortar in this country. Mr. Potter draws a horrifying, but not extravagant, picture of the facility offered by the common wooden staircase for the spread of fire. This is a matter that must be taken in hand by local authorities sooner or later. The authorities compel the external walls and the roof covering to be of incombustible materials; but the two factors in construction which are the main cause of loss of life by fire in domestic buildings are the wood stairs and the wood floors. If these members were to be made of materials that would resist a fire of moderate intensity for a couple of hours at most, the other elements of the structure, however combustible in themselves, would not be a source of much danger. Thus the problem of rendering a domestic building reasonably safe from fire is not a great one.

The first question is how wood is to be replaced in the construction of stairs and floors. There is now no difficulty in procuring a satisfactory substitute for wood for these elements of house building. Coke-breeze concrete is the material most recommended by Mr. Potter for this purpose. It is the cheapest, lightest, and most convenient kind of concrete, inasmuch as it will take nails. "Fireproof coke-breeze lintels, in which small tension-rods are embedded, for use internally over doors and windows, are readily obtainable. Coke-breeze blocks or bricks to insert in walls for fixing joinery thereto, are in every way preferable to, and better than wood." The difficulty is that even this kind of concrete in floors and stairs is dearer than timber. Mr. Potter admits that the cost is about double for concrete, both for floors and stairs; and this is a serious consideration from the commercial standpoint. He gave descriptions of several different makes of concrete floor; drawing the conclusion that whereas coke-breeze makes a weak concrete in comparison with such materials as broken fire-brick or slag, after being heated to a red heat, and quenched with water, coke-breeze concrete comes out first for strength. Inasmuch as good concrete strengthens with age, if a coke-breeze concrete floor is exposed to fire, so as to become red hot, it ought to be still capable when cold of sustaining its original specified load.

With regard to the method of making breeze concrete floors, Mr. Potter states that no steel beams or joists whatever are required for floors up to 15 feet between supports, nor need any iron be embedded therein. Spans up to 12 feet can be executed in 4½-inch concrete, on the flat. Still, he recommends by preference a cambered form of concrete floor, the hollow underneath being concealed from below by a metallic lath ceiling, which, with the intervening air space, materially checks the transmission of sound, which is one of the greatest drawbacks to concrete partitions. It is observed that there is a natural impression that the cambered form of concrete slab is an arch, and throws a considerable thrust upon the supports; but this is not so—the form being really that of a cantilever. The best covering for a concrete floor is narrow strips of wood nailed direct to the concrete.

The paper and the discussion upon it produce the impression that enough is not known concerning the use of coke-breeze concrete in the construction of houses. It may therefore be suggested that, as gas managers have frequently a good deal to do in the matter of house and cottage building, they might take such opportunities as come in their way of experimenting with this material of construction, for the public good. If a fireproof concrete floor or staircase costs the smallest fraction more than the wooden article, the speculative builder will have nothing to do with it, unless under the compulsion of building regulations. Apart from the consideration of expense, however, which deters the ordinary builder from going in for fireproof construction, there are the almost equally potent factors of use and wont, and uncertainty as to results. If builders were to be more familiarized with the subject, they would evolve cheaper methods of construction than any at present known, when almost every fireproof floor must be made under somebody's "patent." The regular, safe, consistent employment of coke-breeze concrete construction at the local gas-works would go far in time to convince the tradesmen of the district as to its advantages.

The Manchester District Institution of Gas Engineers will hold their Spring meeting at Morecambe, on the 21st inst.—a week earlier than usual.

Another Acetylene Company.—La Sociedad Franco-Espanola de Gas Acetilene is the title of a Company which has just been formed in Barcelona with a capital of £48,000.

PERSONAL.

Mr. W. H. Burtonshaw has resigned his appointment as Manager of the Skipton Gas Company; and Mr. James Woodward, of Kirkham, has been selected by the Directors to fill the position.

Mr. F. W. Chamberlain, who is at present engaged at the Sculcoates (Hull) station of the British Gaslight Company, has been appointed General Manager and Engineer of the Bombay Gas Company, Limited, in succession to Mr. Louis Penny, M.Inst.C.E., whose resignation of the position was announced in the "Journal" on the 8th of March last, when applications were invited for the vacant appointment, which is worth £1000 per annum. The successful candidate, who has our hearty congratulations, is a son of Mr. H. B. Chamberlain, the Secretary of the British Gaslight Company.

It has been pointed out that a paragraph in the "Journal" for the 5th ult., referring to the appointment of Mr. J. S. Naylor to the position of Deputy-Manager of the Bradford Road Gas-Works of the Manchester Corporation may in one respect be misleading. It was stated that Mr. Naylor succeeded Mr. T. H. Duxbury; but this hardly correctly describes the change, because, while Mr. Duxbury was Assistant-Manager at the works in question, the Committee on his retirement decided to make a perfectly new appointment, and gave Mr. Naylor the position of Deputy-Manager at a salary considerably larger than that paid to the Assistant.

At the Stoke-on-Trent Town Hall last Thursday, Mr. H. J. Wildin, who has for thirteen years occupied the office of Borough Accountant, was presented by the members and officials of the Corporation with a handsome silver tea and coffee service, on the occasion of his leaving the service of the town to undertake the secretaryship of the Staffordshire Potteries Water-Works Company. The presentation also included an illuminated and sealed copy of a resolution of congratulation passed at the February meeting of the Council, and a silver mounted ebony walking stick. The Mayor (Mr. F. Geen) made the presentation.

On the evening of the 20th ult., about forty of the officials and workmen at the Colne Corporation Gas-Works had tea together at the Crown Hotel, on the invitation of Mr. H. Simmonds, the late Engineer and Manager. The opportunity was taken to present Mr. Simmonds with a handsome silver reading-lamp and shade, in honour of his recent marriage, and his accession to the position of Engineer and Manager of the Bury Corporation Gas-Works. After tea, the party spent a pleasant evening in the concert-room, where a number of vocal pieces and recitations were rendered by members. Mr. and Mrs. Simmonds were the subjects of the principal toast of the evening.

OBITUARY.

The death is announced of M. Edouard Bengel, who, with his younger brother, M. Joaquin Bengel, succeeded to the business founded by their father, whose name, as our readers may remember, is associated with the standard burner used for photometrical purposes in France. Deceased, who had retired from business, was Vice-President of the Chambre Syndicale de l'Eclairage par le Gaz and Judge-Substitute of the Tribunal de Commerce de la Seine.

The death is announced of Mr. Percy Blakelock, of Kelly Castle, near Arbroath, and formerly of Sheffield. From 1880 to the end of 1887, when the Sheffield Corporation acquired the undertaking of the Water Company, Mr. Blakelock was the Chairman of the Company; and his connection with it was marked by the most strenuous, determined, and resourceful, but in the end unsuccessful, opposition to the transfer of the undertaking to the Corporation. His interest in the Company was large; and it had existed in his family since the first local waterworks were started in 1737. Mr. Percy Blakelock, on the death of his brother, Mr. R. Blakelock-Smith, in 1880, became Chairman of the Company. In the following year, he was appointed Managing-Director, at a salary of £1200 per annum; and in 1882, when Mr. W. Ashton, General Manager, resigned, he became practically Manager as well as Managing-Director of the undertaking, and relinquished his private business. On the acquisition of the water-works by the Corporation, he left Sheffield, and settled near Dundee, where he became a jute merchant. It should be explained that the deceased gentleman changed his surname about 1880, along with all the other members of the family, from Smith to Blakelock. His elder brother, Mr. R. Blakelock-Smith, was Law Clerk to the Water Company at the time of the Dale Dyke disaster. Mr. Percy Blakelock had nearly reached the age of 70 years.

In the "Journal" last week we recorded the sudden death, on the previous Sunday, at Oxford, of Sir Vivian Majendie, K.C.B., Her Majesty's Chief Inspector of Explosives. The inquiry into the circumstances attending the sad event resulted in a verdict that the cause of death was failure of a weak heart. The funeral took place last Friday at Charlton; the first portion of the service being held in St. Paul's Cathedral. Reference is made in our editorial columns to Sir Vivian's work in connection with the Petroleum Inquiry, the strain of which, coming upon his usual professional duties, there is good reason for supposing brought about the calamity which has deprived the country of a valuable public servant. It was a singular coincidence that the same issue of the "Journal" which recorded Sir Vivian's death, contained the announcement of a projected acetylene gas exhibition, and that it was in connection with the raw material employed in the production of this gas that his name had not many months previously appeared in our pages. About this time last year, the memorandum drawn up by him on the nature of carbide of calcium and the precautions to be taken in its storage was given in the "Journal;" and it may be remembered that, adopting a suggestion thrown out in our comments thereon, he subsequently amended the regulation relating to the keeping of pure carbide, by specifying that the substance was to be "commercially" pure. Sir Vivian, who was a distinguished officer of the Royal Artillery, was appointed in 1861 Captain-Instructor of the Royal Laboratory at Woolwich; becoming five years later the Assistant-Superintendent. As mentioned last week, he received in 1870 the appointment he held at the time of his death.

NOTES.

Steam-Boilers for Road Carriages.

Discussing the present position of mechanical road carriages, the "Engineer" re-affirms the general proposition that steam is the best possible agent for the propulsion of vehicles along common roads. The chief difficulty in the way of its application to this purpose is the want of a satisfactory boiler. With regard to the boiler fuel, it is argued that this must be liquid. The prospects of a general use being found for coke in this connection are declared to be hopeless. "Coke, anthracite, or the best Welsh steam coal, may be used for the comparatively large boilers needed by heavy vans, big brakes, and vehicles weighing a couple of tons and upwards. But for the motor car intended to carry four, or perhaps six persons at most, petroleum as a fuel is almost indispensable. It is not that steam cannot be made with coke in small boilers, but that it is a nuisance to have to handle coke." The question of the burner is dismissed as already solved by more than one inventor. The major condition of success remains to be fulfilled—it is a small boiler that can be readily opened for cleaning in every part. This is an essential that boiler makers have not as yet supplied. Distilled or rain water is not likely to be generally available for steam-carriage boilers; and if it were, the destruction of the boiler sheeting and tubes would be a drawback to its use. What is wanted is a boiler that will be able to use with immunity the hard and dirty water of the country side; and the easiest way of ensuring this is a type of boiler that can be readily opened up for cleaning. Anyone who has seen a boiler of the locomotive type dismantled after a few months' use with hard water will appreciate the force of this criticism.

An Unsatisfactory Water-Main.

One of the most instructive lessons ever offered in respect of the laying of large mains is derivable from the deplorable experience of the Southwark and Vauxhall Water Company with their new 42-inch trunk main from Hampton to Streatham. All along this line the roads are ruined; and the Company have been put to enormous expense in dealing with leakage from the pipe-joints. It is stated that the trouble is caused by shallowness of the socket and spigot joints; and surprise has been expressed at the circumstance of an experimental description of joint having been adopted for a main of such importance. It has been stated, however, that the trouble with the main is not referable to the shallowness of the joint, which is practically uniform with that most successfully used for the Thirlmere and other pipe-lines. The joint is made without yarn; the sockets being run with lead the full depth. The molten lead is prevented from running into the main at the time of pouring, by an expansion band inside the pipe, which is shifted for the purpose from joint to joint. It is reported that not a single joint of the whole 16 miles of pipe-line has been moved or blown out by the pressure; and there has never been more than small and partial weeping. The trouble is ascribed to the existence, along a considerable portion of the route, of a shifting and weak subsoil, which is sometimes waterlogged and sometimes dry. According to this theory, the main when full of water is too heavy for the ground in which it lies. It should have been laid on a bed of concrete. As a curative measure, clamping the joints has been essayed, at great cost, along the defective portions; but it remains to be seen whether the remedy will prove effectual. If it does, the evidence will be pretty strongly in favour of those critics who have maintained that the joints were too weak in the first place.

The Storage of Energy.

Discussing the problem of what is meant by the term "storage of energy," our contemporary the "Engineer" arraigns modern science as being unable to explain how "energy" is stored up in a fuel or in an explosive, or how it is liberated. The simplest idea of the kind is attached to the operation of winding up a spring, as that of a watch, which subsequently liberates it as wanted for the specific purpose of driving the movement. We may entertain the notion that much the same operation is

effected when we make an explosive; but there is a gap in the analogy which science does not enable us to fill. The text-books on physics tell us that there are two forms of energy—kinetic or dynamic, and potential. The former is realized by a weight in the act of falling; the latter is illustrated in a weight resting in some position whence it can fall—say, on a wall. If we lift a weight up to the top of a wall, we are said to have done work and stored up energy; but nobody can say how the energy is stored. It cannot be in the weight. It is more reasonable to hold that, the work of lifting having been done against gravity, it is in gravity that the potentiality of undoing it is stored. But this does not advance matters much. With regard to the energy stored up in fuel also, it was long taught that "all the energy of combustion was stored up in the solid fuel, which was so much bottled sunlight ready to be let loose. More sensible views have found their way into the world; and it is just beginning to be recognized that as the kinetic energy of water is very much less than that of oxygen and hydrogen, so the combination of the two gases leaves some kinetic energy to spare; and that inasmuch as the kinetic energy of carbonic anhydride is much less, weight for weight, than that of oxygen, a large part at least of all the energy got out of the combustion of carbon is derived from the oxygen instead of the coal. In like manner it may be found that the energy of explosives is derived from some up to the present unsuspected source, and that the materials of the explosives are themselves acted upon as well as acting. Energy is no more stored in them than it is in the top brick of the chimney, although energy was expended in putting it there."

The Paris Sewage Farm.

A recent issue of the "Revue Pratique des Travaux Publiques" gives some particulars of the large sewage farm which has been laid out at Achères for purifying the Paris sewage before allowing it to pass into the Seine; and they have been reproduced in "Engineering." The inhabitants of Paris number 2,500,000, and the total flow of sewage is stated to average 17,660,000 cubic feet per diem. This is collected in great intercepting sewers, which convey it by gravitation down to Clichy, where it is raised 118 feet by pumps and distributed by gravitation through the farm. The pumping-engines at present installed are capable of indicating 1200-horse power in the aggregate; but future additions will raise this to 6000. It is stated that experience shows that 1 acre of suitable soil can take 1580 cubic feet of sewage daily, so that an area of about 11,120 acres would be needed to deal with the whole of the discharge of the Paris sewers. A very high degree of purification is reached; the effluent proving to contain fewer bacteria per cubic centimetre than most uncontaminated streams. The land also has been greatly increased in value; being now worth five times as much as it was before being made a receptacle for the sewage. The farm at Achères is 2471 acres in extent, and is under the control of M. Bona, who principally raises beetroot, though this crop will admit of much less sewage being passed on to the land than certain others. The main conveying the sewage from the pumping-station is 43·2 inches in diameter; while a secondary system of pipes, ranging from 31 to 16 inches in diameter, serve as feeders to the irrigation trenches, into which the sewage passes through 11½-inch valves. The ground is laid out and the irrigating trenches are so arranged that the only service needed in regulating the flow is the opening or closing of the valves just mentioned. The crop which can stand the most sewage is grass—a meadow being, it is stated, uninjured by a flow of 2,430,000 cubic feet per acre per annum. Lucerne can take 1,790,000 cubic feet per annum; artichokes, 593,000 cubic feet; flowers, parsley, sorrel, &c., 536,000 cubic feet; leeks, cabbages, and celery, 325,000 cubic feet. Beetroot, carrots, and beans, however, will take only 197,000 cubic feet, and potatoes, asparagus, and peas but 141,000 cubic feet per acre per annum.

Institution of Civil Engineers.—At the annual general meeting of the Institution on Tuesday last, the result of the ballot for the election of officers was declared as follows: President, Mr. W. H. Preece, C.B.; Vice-Presidents, Sir Douglas Fox, Mr. J. Mansergh, Sir W. Anderson, K.C.B., and Sir W. White, K.C.B. Among the new Council are Sir A. R. Binnie, Mr. Charles Hawksley, Mr. George H. Hill, Dr. Hopkinson, Dr. A. B. W. Kennedy, and Mr. Alexander Siemens.

A New Incandescent Mantle.—An American chemist named Priestley, while studying the Chardonnet method of making artificial silk, conceived the idea of adding a certain proportion of oxides of the rare earths to the collodion from which this material is produced. Contrary to his expectations, the mixture passed successfully through the tiny glass tubes employed by Chardonnet; and a strong, pliant, and at the same time very fine, filament was obtained, containing, it is claimed, three or four times as much ytrria as the ordinary cotton fabric. The twisted threads are knitted into mantles, which are stated to be stronger than the old ones, and at the same time of greater illuminating power, owing to the larger proportion of yttria in them. The new mantle differs entirely from the Welsbach, because the constituent parts of the thread are yttria and collodion. It is a light-emitting thread produced in a new spinning-mill, as compared with an impregnated fabric. According to "Science Française," Dr. Auer has secured the foreign patents; and the inventor has only the French one.

TECHNICAL RECORD.

NORTH OF ENGLAND GAS MANAGERS' ASSOCIATION.

Half-Yearly Meeting at Newcastle.

The Forty-second Half-Yearly Meeting of the North of England Gas Managers' Association was held in the offices of the Newcastle and Gateshead Gas Company on Saturday last. There was a very good attendance of members. Mr. J. HOLLIDAY, of Scarborough, the President, was in the chair.

The HON. SECRETARY (Mr. J. H. Penney) read the notice convening the meeting.

The PRESIDENT moved approval of the statement of accounts for the past twelve months, which had been circulated among the members, and which, he said, was very satisfactory—showing a rather bigger balance in hand than when the year started.

Mr. C. DRU DRURY (Sunderland) seconded the motion, and it was adopted.

NEW MEMBERS.

The following were admitted to the Association: Members: Mr. James Gibson, Manager of the Gas-Works, Beverley; Mr. John H. Wright, Assistant Manager of the Gas-Works, Hendon, Sunderland; Mr. J. J. Carr, Secretary of the Tynemouth Gas Company, North Shields. Associate: Mr. H. W. R. Kenningham, Manager of the North Brook Vitriol-Works, Bradford.

The PRESIDENT said he had a rather painful duty to perform. It was to announce the death of one of their members—Mr. J. G. Nichols, of the Darlington Gas-Works. Mr. Nichols was one of those men who did not make themselves very prominent in the ordinary way; but he was one who was always well regarded when known. He (the President) knew him very well indeed, both in business and in private life. The Association had been looking forward to his taking a prominent part in their work at an early period. However, death had intervened; and all they could do was to express their regret.

Mr. D. TERRACE, of Middlesbrough, then read the following paper on

THE ADOPTION OF CARBURETTED WATER GAS.

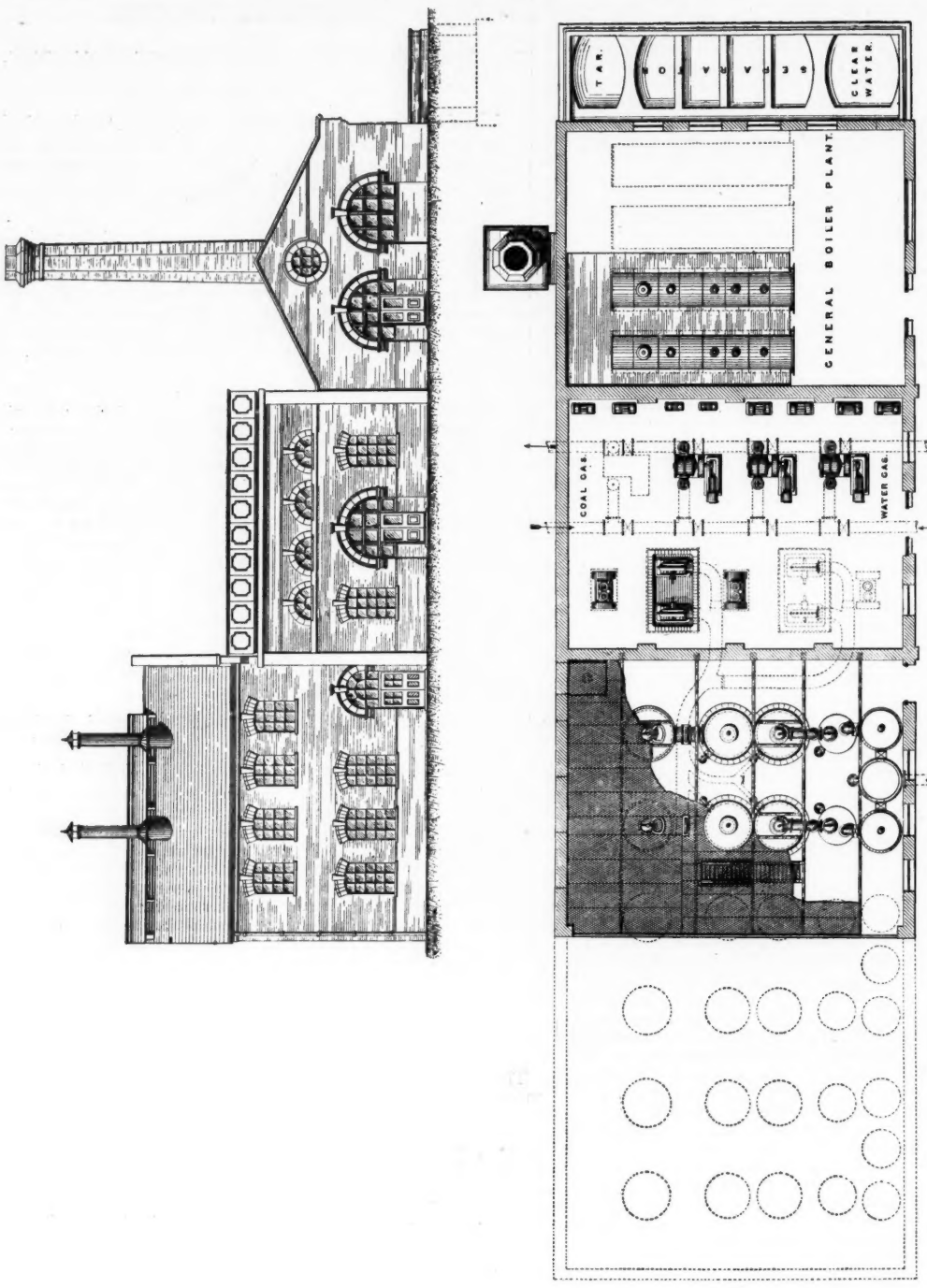
Although all the circumstances which have led to the introduction of carburetted water gas into the various gas-works could not be enumerated in detail, still, as showing the trend of the question, a few of these may be indicated. The saving of ground-space is one of the principal features of the plant, as only about one-fifth is required as for the production of the same quantity of coal gas. Thus where coal-gas manufacture is carried on in works which have become congested through repeated extensions in confined areas, and where land could not be readily obtained for extensions, carburetted water gas has come to the rescue; the installations also proving great acquisitions in other ways. Economy in capital expenditure has doubtless weighed with several managers when considering the means for future extensions, as only about one-third the amount necessary for coal gas is required. The saving of holder room may also be noted, as the making power is under such perfect control that in a very few hours additional carburetted water gas can be made to meet the ever-changing requirements of city or town; or, on the other hand, as readily cease to be made—and that without any detriment to the plant. The command of the power of enrichment is an advantage of considerable importance, when it can be accomplished so readily and economically in comparison with present methods.

Getting an enhanced value in coke sales is not only of great moment, but the smaller yard-space required for storage is of some importance. The prices obtained for the other residuals—tar and ammoniacal liquor—have depreciated very much during the past ten years; being only now about one-half of their former values. It is not too much to expect that when carburetted water gas is in more general use, the greatly lessened products will result in securing as much for them as was received in former times. Instead of paying high prices for the better-class gas coals, selections can be made of the commer kinds, as the fullest quantity of gas can be taken from them, and the standard quality obtained by simply adding a small quantity of oil. In distribution, carburetted water gas has proved its efficiency by curing the naphthalene bugbear, thus affording a happy relief to those afflicted.

These are some of the outstanding advantages accruing from, and induced by, the introduction of carburetted water gas; but it may be observed that they are only possible if the price of oil were to remain such as to make it available for gas making. In this respect, reference may be made to what the writer had the honour of reading ten years ago to the North British Association of Gas Managers, in his Presidential Address thus—

> The use of oil as a substitute for coal in gas making has again been receiving attention; the very high luminosity of this appearing to be considered one of its principal advantages. This, however, is only one side of the question; and it may be conceded that we, as producers of light, are alive to the merit or otherwise, of employing oil in our manufacture. The system may be suitable where a supply of gas coal at a moderate price is not available; but it will not be generally adopted until the steady price of the raw material makes it more profitable to use than coal.

When this was written, the prevailing idea was to carbonize oil



HUMPHREYS-GLASGOW MIDDLESBROUGH INSTALLATION OF CARBURETTED WATER-GAS PLANT.
Present Capacity, 1,250,000 Cubic Feet Daily.
Ultimate " 3,750,000 " "

in like manner to coal; and it was not then seriously contemplated that the process of making carburetted water gas as used in America would soon be so general in nearly all the largest towns in this country. As plants of an aggregate daily capacity of 75,000,000 cubic feet have been, or are being erected, it may be safely assumed that not only has the system come to stay, but every confidence must be felt that the variations in the price of the raw material (oil) will likely be confined within reasonable limits.

The outline of the working of the apparatus is no doubt familiar to many of you; but to make this clear to all, a short description of the plant and the method of working it may here be given. The illustration shows the Humphreys-Glasgow Middlesbrough installation; the building illustrated including room for extensions, &c.

The Middlesbrough plant consists of—(*a*) Two sets of gas-generating apparatus, with the necessary washers, scrubbers, condensers, &c., all of which are contained in the generator-house; (*b*) Two sets of blowers and engines, exhausters, oil-pumps, lift-pump, and circulating pumps, situated in the machinery-room, which is covered by the circulating water-tank; (*c*) two steam-boilers; and (*d*) a tar separator. These constitute the plant proper; but in addition there are—a relief holder, four purifiers, a station meter, and oil-storage tanks.

The gas-generating and fixing plant of each set consists of three cylindrical steel shells, termed the generator, the carburetter, and the superheater. Each has a fire-brick lining, the space between this and the shell being packed with non-conducting material, which is so effective that the hand can be held on any part of the shells when the plant is at work. The generator is provided with a door on the top for charging with coke; another at the bottom for removal of ashes, &c., from the ash-pit; and also four doors on the side for clinkering, which doors are all closed during the period of gas making. It is connected both at the top and the bottom by means of pipes to the carburetter. The carburetter and superheater are connected near the bottom, and filled with chequer-brickwork, so that the gas in passing through them comes in contact with a very large heating surface. The generator is filled with red-hot coke, and the chequer-bricks kept at a red heat; the intensity of the latter depending on the class of oil used. The *modus operandi* is then as follows.

The blast-valve on the generator is opened, which admits the air under the fire-grate, and the fire blown up till all the coke is thoroughly incandescent—this being the primary use of the blast—but as the gases formed by the passage of air through the red-hot coke are combustible, advantage is taken of this to keep up the heats in the carburetter and superheater, by having

connections from the blast-main led to the top of the carburetter and the bottom of the superheater, and by opening valves on these pipes air is admitted to burn the producer gas and thus heat up the brickwork. Sufficient air is admitted to bring the brickwork up to the required temperature during the time that it takes to make the coke in the generator thoroughly incandescent; and the waste gases escape through a stack on the top of the superheater. When this stage is reached, the blast-valves are closed, and steam is admitted at the bottom of the generator; a valve on the top of the superheater is closed, to prevent the gas escaping out of the stack; and a measured quantity of oil is sprayed in at the top of the carburetter, where it is immediately gasified. The steam in passing through the red-hot coke is broken up into water gas, which passes through the pipe connecting the two vessels at the top into the carburetter. It there meets the vapourous oil, which in travelling down through the carburetter and up through the superheater, in contact with the hot chequer-brickwork, becomes thoroughly fixed; and a permanent gas of the desired illuminating power is the result.

When the gas reaches the top of the superheater, it is prevented from escaping up the stack by means of a valve called the stack-valve, which is open during the blow, but closed during the run. It then travels down the off-take pipes (being utilized in so doing to heat the oil which is being sprayed into the carburetter), forces the seal in the washer, passes through the scrubber and condenser, and thence to the relief holder. When this has gone on for a time, the temperature of the fire in the generator becomes lowered, as does also that of the brickwork in the carburetter and superheater; and the steam and oil are then shut off and the stack-valve on the top of the superheater opened, and the blast turned on as before, and the operations repeated. The period during which the blast is used is termed the "blow," and the gas-making period, the "run."

After a few such runs have been made, in order to keep the bottom of the fire from becoming dead through the constant action of the steam on it, the steam is caused to enter at the top instead of the bottom of the generator, and travel downwards instead of upwards through the fire. By a simple contrivance, the hot-gas valve connecting the generator top and carburetter is closed, a similar one connecting the bottom with the carburetter opened, and the steam made to enter at the top instead of at the bottom by one operation.

The scrubber is similar to an ordinary coal-gas scrubber, and is filled with wood grids; water being sprayed in at the top. The condenser is of the tubular type; and in the Middlesbrough plant, one condenser is common to the two sets. The gas making being intermittent, a relief holder is necessary between the apparatus and the exhausters, to maintain an even flow of gas through the purifiers, &c.; and one of the old coal-gas holders is used for this purpose. From thence, the gas passes through the exhauster to the purifiers and meter, and is then mixed with the coal gas in our other holders. The purifiers are also a set of old coal-gas ones, four in number, and are worked similarly; the chief impurity to be got rid of by them being carbonic acid. The water used in the scrubbers is supplied from the overhead tank; and after passing through these, it finds its way to the tar separator situated at the end of the buildings. After the tar is separated from it, it is pumped into the overhead tank to be used again. This is the use of the circulating pumps.

The oil is at present brought into the works in tank waggons, and run into four cylinders situated on supports built in an old gasholder tank. It is pumped thence, by means of the oil-pumps in the machinery-room, through the oil heater in the off-take pipes into the setting.

All the machinery is in duplicate, so that should any part at any time be temporarily out of order, gas making can go on as usual; and so the plant is kept at full work from the beginning to the end of the shift, when gas making is stopped for the purpose of cleaning the fires. Of course, if both sets are at work, one set still keeps making, while the fire of the other is being cleaned. The cleaning, or clinkering as it is termed, is done from the four doors on the generator sides; and, as may already have been gathered, it is done once in eight hours—at the end of each shift.

All the valves in connection with the generating plant are worked from the operating floor, and are provided with a patent interlocking gear which reduces the possibility of error to a minimum, by preventing the valves being worked in other than their proper order. The coke used is brought from the adjoining retort-house in hopper buggies, and raised to the operating floor by means of a hydraulic lift; and it is fed, either hot or cold, into the generator by means of the door on the top. The quantity of oil injected every run is measured by means of an oil-meter fixed on a stand in a convenient position for the operator; and a battery pressure-gauge is fixed on the side of the superheater which communicates by means of pipes with the different parts of the apparatus, so that the gas maker can at any time see the pressures at the various points. The whole of the operations are very simple, and the heats easily kept constant; and when once the men get accustomed to the proper heats required for the oil being used, no trouble is found.

The generating plant, as before mentioned, is in two sections, each having a daily capacity of 625,000 cubic feet—making a total of 1,250,000 cubic feet per day; and as these can be got into full working from the cold state well within four hours to make gas of any required illuminating power, some idea of the utility of the process may be gathered. The plant was erected during the summer of 1897, by Messrs. Humphreys and Glasgow, of London; and it has been at work since last autumn without a single hitch or difficulty. It might also be mentioned that it is capable of extension, at a comparatively small outlay, to three times its present capacity, by the generator-house being merely lengthened towards the street line; the boiler-house and the machinery-room being already of ample size to accommodate this, as also to include exhausters for our coal-gas plant.

You will observe we have been working with temporary oil-storage tanks; the land for the erection of the permanent ones not having been yet secured. This rendered necessary our receiving the supplies in oil-cars, which added materially to the cost of production, owing to the additional charge for carriage, &c., from the West Coast. It is intended, however, to erect oil-storage tanks near the river, so that a tank-steamer can be run alongside, and the oil pumped out of it into them; thus securing from six to twelve months' supply at a time.

When we were working both sets during the winter months, the purifiers which were part of the set for coal gas, used temporarily, were rather overworked; thus also adding to the usual costs during the first season. It might also be stated that, where no profitable market exists for the sale of oil-tar, means are generally taken to use it as fuel for steam-boilers.

Notwithstanding the foregoing drawbacks in our first season, the costs of the carburetted water gas compare favourably with those of coal gas when the quality is taken into account, which is the only criterion of working. Thus—

Cost of 1000 *Cubic Feet of Carburetted Water Gas of* 24*-Candle Power into Holders.*

Wages, making gas	1·0d.	
Coke	1·7	
Oil	9·8	
Purification	1·3	
Wear and tear	0·2	
		1s. 2·0od.

Or 0·58d. per candle per 1000 cubic feet.

Cost of 1000 *Cubic Feet of Coal Gas of* 14*-Candle Power* (*Old Working with Horizontal Retorts*) *into Holders.*

Wages, making gas	4·45d.	
Coals	11·15	
Purification	0·25	
Wear and tear	1·50	
		1s. 5·35d.
Less—		
Tar	1·78d.	
Ammoniacal liquor	0·83	
Coke	4·06	
	0 6·67	
		0s. 10·68d.

Or 0·76d. per candle per 1000 cubic feet.

Mixed Gas of 17*-Candle Power.*

70	per cent. of	14-candle gas at	0s. 10·68d.	
30	,,	24 ,,	,, 1 2·00	
100	,,	17 ,,	,, 0 11·67	

Or 0·68d. per candle per 1000 cubic feet.

Thus the difference between 10·68d. and 11·67d. is 1d. per 1000 cubic feet, for which we get 3-candle power enrichment—*i.e.*, 0·33d. per added candle.

These costs will be greatly lessened when the carburetted water-gas plant is fully completed with permanent oil-storage tanks, and working with inclined retorts, making our fixed working as follows:—

Cost of 1000 *Cubic Feet of Carburetted Water Gas of* 24*-Candle Power into Holders.*

Wages, making gas	1·0d.	
Coke	1·7	
Oil	7·8	
Purification	1·0	
Wear and tear	0·2	
		0s. 11·70d.

Or 0·487d. per candle per 1000 cubic feet.

Cost of 1000 *Cubic Feet of Coal Gas of* 14*-Candle Power into Holders* (*New Working with Inclined Retorts*).

Wages, making gas	2·45d.	
Coals	11·15	
Purification	0·25	
Wear and tear	1·50	
		1s. 3·35d.
Less—		
Tar	1·78d.	
Ammoniacal liquor	0·83	
Coke	5·40	
	0 8·01	
		0s. 7·34d.

Or 0·524d. per candle per 1000 cubic feet making the

Cost of 1000 *Cubic Feet of Mixed Gas of* 17*-Candle Power into Holders.*

70	per cent. of	14-candle gas at	7·34d.	
30	,,	24 ,,	,, 11·70	
100	,,	17 ,,	,, 8·65d.	

Or 0·509d. per candle per 1000 cubic feet.

Or (say) for 1·31d. per 1000 cubic feet we get 3-candle power from enrichment—*i.e.*, 0·44d. per added candle.

The power to meet by oil enrichment the contingencies of

varying quality, is found a great advantage in carburetted water-gas making; and when this can be done with coal gas at 7·34d. per 1000 cubic feet, at a cost of less than ½d. per added candle per 1000 cubic feet, its economy, considered merely as a process of enrichment, cannot be doubted.

As the specific gravity of carburetted water gas is greater than common coal gas, we have kept on about 2-10ths additional pressure in the street-mains to meet this, and had no complaints as to want of an adequate supply. Neither has there been any trouble from a certain alleged characteristic of the gas, although we have used from 25 to 30 per cent. of it all through the dark season.

Some of the collateral advantages of the adoption of carburetted water gas have already been mentioned; but, in closing, a few experiences may be given to amplify these. Instead of formerly only realizing at the rate of about 4d. per 1000 cubic feet of gas made for coke sold, about 6d. is now received, owing to the improved market through lessened production by less coal gas being made, and the use of a considerable quantity in making carburetted water gas. Thus, instead of the coke yard being piled high as in previous seasons, at great cost for trimming, and having to sell what we had at a loss to get quit of it, there is now always a ready sale at very good prices. Consequently the 2d. gained on coal gas is an absolute credit to carburetted water gas, although it does not appear as such in the above costs, and the mixed gas gets the full benefit of the transaction.

All the gas required was supplied with ease and comfort, although there was only available storage for 1 million cubic feet, while we sent out double that quantity; thus proving that in any works short of holder room, instead of spending (say) £20,000 on a new holder and land for same, this amount would be of more lasting benefit if applied for manufacturing plant of the type under review—for not only is it extremely useful to make up for lack of storage, but more important even than this is the great facility with which the number of coal-gas retorts are put on and off to meet varying demands. This is managed with a steadiness that is not attainable when coal gas alone is made; as having carburetted water gas as an auxiliary, there need be no fluctuation in the number of retorts in use, except and only that due to seasonable requirements—all the varying quantities wanted to make up for weather effects being so readily furnished by the immediate increase or decrease of carburetted water gas, and that without the slightest damage to the plant. It need scarcely be mentioned—in fact, it is impossible to say—what lasting destruction is caused to the settings of retorts by the heating up and letting down, when every storm approaches. Surely if this can be avoided, it is a great boon; and if to this be added the avoidance of anxiety on the part of the manager, and the expense of keeping the retorts and stokers in readiness in case of emergency, the advantage is indeed a great one.

Observation has already been made as to the comparatively small space occupied by the carburetted water-gas plant, and also the great economy effected in capital cost relative to those of coal gas. Taking the area of the Middlesbrough plant as a basis for the carburetted water gas plant (which not only contains the coal gas, steam, and exhausting plant, but also provision for 200 per cent. extension in these and other departments), and the area of our new inclined retort house, &c., as the basis for the coal gas, the latter occupies an area of about five times that of the former. Whether, therefore, the introduction of carburetted water gas as an auxiliary to the manufacture of coal gas be considered in relation to capital expenditure, ground space required, or economy in working, it will be conceded from the foregoing that, with these and the other advantages mentioned, its adoption has been a decided acquisition.

Discussion.

The PRESIDENT said they were extremely indebted to Mr. Terrace for the able and lucid paper he had given them on the subject of carburetted water gas, which had caused a number of people great fears as to what would happen were it generally adopted. Mr. Terrace had cleared away many of the cobwebs which had been gathering in most of their brains regarding carburetted water gas. So far as he, personally, was concerned, his knowledge of it hitherto was a paper one only; but he hoped he was going to get into close quarters with it very soon. With regard to the saving by it, there seemed to be considerable divergence of opinion. There was a very eminent Engineer in the North who said that in certain districts carburetted water gas was of no good—that what was wanted was extended holder room; that it was much cheaper to put in more retorts, and if a sudden demand for gas arose, and they had good storage behind them, it was better than fitting up carburetted water-gas plant. He supposed this opinion was due to the price of coal in that gentleman's immediate district. There seemed to be a difference of opinion also with regard to the relief holder. Some connected their coal-gas supply and their carburetted water-gas supply directly from the exhausters, and let them mix there. He did not know whether Mr. Terrace had any particular idea as to the desirability of allowing the two gases to mingle in the holder or after the station meter. Some mixed it at one point, and some at the other. He did not know that there was a great deal in it; but in Scarborough they were going to mix them before they went into the holder.

Mr. TERRACE explained that the gases were mixed by him before they went into the storage holder. The holder shown on the diagram was simply a relief holder. They did not mix the gases until after they had passed the carburetted water-gas station meter.

The PRESIDENT (continuing) said there was this point about the interlocking gear, which he might mention, that there was a small plant within a short distance of Scarborough, and he did not know whether it was due to the interlocking gear, or to carelessness in working, but they could hear explosions in the plant all over the town.

Mr. TERRACE: It must be due to carelessness in working.

Mr. C. DRU DRURY (Sunderland) agreed with the President in thinking that their thanks were due to Mr. Terrace for the capital paper he had read to them. He, like the President, had only a paper knowledge of water-gas plant; and he should like to ask Mr. Terrace one or two questions about it. He should like to know whether Mr. Terrace had had any analysis of the gases made, so as to show the proportion of carbon monoxide which was sent out with the gas, and whether the calorific value of the mixed gas was lowered to any serious extent. Also whether he had any complaints on this point from the users of gas-engines, and those who used the gas for heating purposes. He would further like to know as to the beneficial effect water gas had on naphthalene. He saw that Mr. Terrace increased the town pressure by 2-10ths, which, he supposed, was just about the amount which was required to meet the increased specific gravity. But he was afraid that this would also tend to increase the consumers' bills. He supposed that Mr. Terrace would use the plant to its full capacity, and that he could not use it to any less extent than its maximum capacity with any economy. He would like to be clear on this point. He should also like to know the temperature of the gas as it came from the superheater—before it went into the washer.

Mr. J. HALL (Gateshead) said he would like to ask Mr. Terrace what was the effect of the gas when it went into the general holder, if it was stored for a week. How much of the gas was permanent at the week's end? He could quite understand that it was useful for immediate delivery; but that beyond immediate delivery there would be considerable loss. He was quite satisfied that oil gas would have to be the gas of the future, unless they could get their coal elsewhere than where it came from at the present time.

Mr. E. H. MILLARD (Durham) said he also was one of those who simply so far had a paper acquaintance with carburetted water gas; but he was now going a little in for it. What led to their adoption of the process was that their coal had all to be carted into the works, and their coke to be carted away. By this process, however, they would save the carting of some 2000 tons of coal and 1500 tons of coke yearly; and they would simply have to pay cartage on 450 tons of oil. So that, as regarded economy, the process should turn out very well with them. He did not think that Mr. Terrace had cleared up the point about the illuminating power. Oil gas was said to be of 24-candle power. Some years ago they had a controversy in the "JOURNAL" as to the difference between illuminating power and illuminating effect. He wanted to know if Mr. Terrace, in his experience, got the full illuminating effect of his illuminating power. He himself was inclined to be rather dubious on the point. Their friend Mr. Ford had had a year's working of the process, and he hoped he would give them the benefit of his experience with it.

Mr. W. FORD (Stockton) said he fully expected one of his neighbours to get up and say a few words, so that he might draw Mr. Terrace out a little. As this had not happened, he would make a few remarks regarding water gas at Stockton. He fully considered the matter with Mr. Terrace. They went together on a trip to Belfast to see the plant, and were there very much taken up with it, and recommended it to their Committees. He got a little the start of Mr. Terrace; but his friend had shown more wisdom in putting down a double installation. Their esteemed President seemed to be under a misapprehension as to the relief holder. The manufacture of carburetted water gas was intermittent; and the volume of gas produced was so large that it would require plant, such as meters and purifiers, of nearly ten times the area necessary for the production, unless they provided a holder as a relief. As Mr. Terrace had very clearly put it, the blow was four minutes and the run seven minutes. A very large quantity of gas was made in these seven minutes; and if they had to pass all this through their exhausters, it would be utterly impossible to regulate them. He put the water gas into the relief holder, and then mixed it with the foul coal gas; and the two gases passed together through the exhausters, washer, scrubbers, and purifiers, and both went through the same station meter into the storage holder. He was one of those who were severely criticized by their friend from Yorkshire when he said it was simply "duffers" who required to go in for water gas. He did not agree with this. The constituents of water gas were so different from those of coal gas that, as an enricher, it was, in his opinion, the simplest, best, and safest method that could be adopted. It enabled them to have a variety—indeed, a great choice—of coalfields. If they were required, as he was, to produce gas of 16-candle power, to do this from coal they would be tied down to one or two collieries in the district; whereas with the assistance of carburetted water gas they could, as it were, descend the scale of luminosity in their purchase of coal, and with a very small percentage of oil they could in the

course of a few minutes increase the illuminating power of the gas up to whatever standard they required. One great benefit derived from using water gas was, as had been lightly touched upon already by Mr. Terrace, the removal of naphthalene, of which he had had a very sad and long experience. When he went to Stockton thirty years ago, there was left to him as a legacy, by an eminent engineer in their profession, the question of how to cure it. The simple method of plunging it out was the only one available. He had been troubled with as many as 500 complaints in a day. His only remedy was putting benzol into the pipes. He was proud to say that from a fortnight after they started the carburetted water-gas plant, he had not known of the slightest condensation of naphthalene. It had saved him, perhaps, the keeping of some four or five plumbers to go about in winter attending to naphthalene obstructions. They had, of course, had a very mild winter; but in previous seasons of a similar character he had been troubled with naphthalene. When on a visit to Paris, he saw Pelouze's condenser, and thought it was a perfect cure; but now he questioned very much whether it would be effective with Durham coal. But this much he could say—he had not had a single complaint with regard to naphthalene during the whole of past winter. He attributed this entirely to the use of carburetted water gas. Another thing which had possibly more effect in satisfying his conscience than anything else was connected with the Sunday labour question. He had made several futile attempts to allow his men to be off for eight or ten hours on Sundays; but until this process came to his hand, he had never been able to do so successfully. At the point of exit from the water tubular condensers, the average temperature of the carburetted water gas during the past winter of six months was 70° Fahr. The gas at this temperature was going into the holder. He had worked it both higher and lower; but he found that working uniformly at this temperature gave him great satisfaction. He thought the use of carburetted water gas would enable them to benefit this country very much. If they considered the quantity of coal which was exported from England, it was plain that the use of oils from other countries would very likely extend the life of their coalfields, perhaps for hundreds of years.

Mr. T. Bower (West Hartlepool) remarked that, unlike his neighbours, Mr. Ford and Mr. Terrace, he should not be able to give them the benefit of his experience with carburetted water-gas plant, for the simple reason that up till now he had had nothing to do with it. His remarks, therefore, would be confined more particularly to a few general observations with reference to some experience he had two or three years ago—before advising the Company he represented as to the steps to be taken in regard to extensions. At West Hartlepool they were exceedingly cramped for space in more ways than one. They had obtained parliamentary powers for the acquisition of a large plot of land, which enabled them to proceed at once, if they so desired, with the erection of ordinary coal-gas works. They had already a gasholder erected on the plot of land, as a first instalment of a new gas-works; and the question resolved itself purely into one of expenditure of capital as against working expenditure. It was felt by him that the time would soon come when new coal-gas works would be necessary, and that it would only be a temporary tiding over of their difficulties if they were to go in for a carburetted water-gas plant then. The information he obtained at the time led him to the general conclusion that, while the erection of a small installation of carburetted water-gas plant would certainly tide him over his difficulties for a few years, yet there were other difficulties to contend with, which would be very large factors in the question he had to consider. But before giving the meeting his own version, he must make a remark as to what Mr. Terrace put forward as the cost of the production of water gas of 24-candle power. He seemed also to have made very considerable strides in the production of his coal gas. At the time he spoke of he was not able to get definite information from anyone that he had been able to produce gas at less than 1s. per 1000 cubic feet, into the holder. He thought, speaking generally, it would be found that to-day this was nearer the average figure than Mr. Terrace's 10½d. In fact, he knew some at the present moment to whom gas was costing as much as 14d. or 15d. When he came to the resolution not to go in for a carburetted water-gas plant, his decision was based principally on the fact that the cost of production was more than they could afford if they were to sell gas at their then existing rate. Being a Company, they laboured under certain disadvantages, which his friends, Mr. Ford and Mr. Terrace, did not. Very serious objections had been taken to the gas; and they felt that, if there were to be no monetary advantage in adopting carburetted water gas, why should they, as a Company, subject themselves to annoyance? There could be no doubt that gas companies did stand in a different position from corporations in regard to such matters. Corporations had a knack of doing things in their own way, which companies could not attempt. With regard to naphthalene, there could be no doubt that it was a bugbear to all gas managers, and especially to those who were situated in the North-east part of England. He had had very considerable trouble with naphthalene; but he was happy to say he was now nearly in the same position as Mr. Ford. They had hardly ever a case of naphthalene now; and he attributed this, not to anything which had been done in the manufacture of gas, but to the exceptionally mild winter they had had. He ventured to say that if they had had such a severe winter as they had some years ago, the result might have been as bad at Stockton and Middlesbrough as it was then; and so he thought it would be rather too much to conclude that carburetted water gas did away with naphthalene troubles. But if it should turn out to be so, it would be a very great recommendation in favour of carburetted water gas. Mr. Terrace touched upon a point which he had not heard mentioned before, with reference to oil tar. He understood Mr. Terrace to say that there was no outlet for it. Now, it occurred to him that one of the difficulties at his works was the getting rid of breeze. If there would be another factor coming in which would do away with the sale of breeze, it might be unfavourable to them. In most works they were putting up boilers to enable them to utilize breeze as far as they possibly could, in their own works; and if oil tar took its place, it would be so much the worse for breeze. With respect to the regulation of the quantity of gas, might he ask if Mr. Terrace had any difficulty in doing this. He said that something like 25 or 30 per cent. of carburetted water gas was used; and he (Mr. Bower) took that to mean the average of the total. Might he ask whether, on dark days, when he had been pressed with his coal-gas plant, there was not a tendency to rush in a higher proportion of carburetted water gas, and, if so, what means he had of measuring or gauging the quantity going in? In stating what he had, he wished it to be understood that he was in no way biassed against carburetted water gas. In fact he was rather more an enthusiast in the matter; but, all things considered, with regard to their own works, he had come to the conclusion that the time had not yet arrived when he might safely introduce it. However, considering the customary caution which his friend, Mr. Ford, always exercised, he was afraid that he might make him a convert. He believed that Mr. Ford had obtained excellent results; and any opinion which he might come to would tend to fix their minds permanently on the subject.

Mr. W. Doig Gibb (Gateshead) said that, in common with others, he had only a paper knowledge of the subject. But about a year ago he had an opportunity of travelling round a number of works in England in which were installed carburetted water-gas plants; and perhaps he might be allowed to read an extract from the report he then submitted to his Directors. Of course, it related to Newcastle, and did not apply to any other place:—

> It may be stated that it is useless to consider water-gas plant as a means of producing gas continuously throughout the year in Newcastle, since the local conditions allow coal gas to be produced so cheaply. In 1896, the manufacturing charges for this per 1000 cubic feet were 8·45d., and the charges for water gas of similar value would have been about 11·24d. As against this there is smaller first cost for water-gas plant; but the interest saved on this would not be sufficient to compensate for the higher cost of production when used continuously.
>
> It is held by most engineers that it is absolutely necessary to have about 10 per cent. spare producing power standing idle at the busiest part of the year in case of breakdowns, sudden fogs, want of stock, partial strikes, &c. The question of the cost of producing gas from this spare power is therefore altogether secondary to other considerations, such as the rapidity with which the plant can be got into action, and the quantity of gas which can be produced without depending on a large body of men. Assuming that it be only an emergency plant, I very strongly recommend that it be a water-gas plant, and summarize the reasons which influence me in this decision.
>
> 1.—The small ground space occupied.
>
> 2.—The saving in first cost of water-gas plant as compared with coal-gas plant would be £15,000 for a production of 1,500,000 cubic feet per 24 hours.
>
> 3.—With four hours' notice, cold plant can be working to full capacity.
>
> 4.—The plant may be shut down instantly.
>
> 5.—The candle power is under the most complete control.
>
> 6.—Gas has almost no sulphur impurities. (It has an excess of carbonic acid; but this is not included in legal impurities.)
>
> 7.—Its solvent effect on naphthalene.
>
> 8.—For enrichment purposes in a large works in Newcastle it would be nearly as cheap in continuous running as using cannel for an enricher.
>
> 9.—Independence of crises in the coal supply as long as coke is available.
>
> 10.—Practical independence of labour. (In proportion of 1 to 6, and an easier class of men to get.)

This represented his views at the present time. As to the relief holder, he understood that, instead of having to provide purifiers, exhausters, and everything else to deal with the gas produced in seven minutes, they got eleven minutes in which to do it. Mr. Ford's method of working, he thought, suggested several practical advantages. It always seemed to him that if they mixed carburetted water gas with coal gas, and tossed it about in their scrubbers and other plant, it had very much less chance of layering than if the gases were mixed after they had passed through different apparatus. Mr. Bower objected to the burning of oil tar, and spoke of a difficulty in the getting rid of breeze. He suggested whether it would not be possible to make briquettes by a combination of the oil tar and the breeze, and sell them as a fuel, as was done in the case of coal dross and pitch. He only suggested this, and did not know whether it was practical.

Mr. Ford asked to be allowed to make one remark with regard to the permanence of carburetted water gas. Without the water gas, his leakage was 5 per cent.; for the year to the 31st of March, using water gas, it was 4 per cent.

The President said he should like to ask Mr. Terrace one or two questions. He was afraid he could not get hold of the idea of the relief holder. He thought he was correct in saying that

there were cases in which the carburetted water-gas exhausters and the coal-gas exhausters stood side by side, and where, immediately the water gas passed the latter, there was a connection, and the gases travelled together through the condensers, scrubbers, and purifiers into the holder.

Mr. TERRACE said this was so. Mr. Ford worked in that way; and his relief holder was the only means he had of measuring the carburetted water gas.

The PRESIDENT said he understood it now. With regard to the cost of carburetted water gas, it seemed to him to be entirely a question of locality. The cost of coal in Newcastle was so low that apparently it would not be worth while putting down carburetted water-gas plant. Their cost of gas into the holder was 8·45d., as against Mr. Terrace's 10·68d. At Scarborough it cost them 1s. 2·45d. into the holder. They had to pay more for the carriage of the coal from the pits to the works than for the coal itself; and he thought that they would be able to make carburetted water gas at probably 2d. per 1000 cubic feet less than they manufactured coal gas. Oil tar, he believed, was being used for other purposes than boiler firing. He thought there was a firm in the Liverpool district who were using it for enamelling—at least they were making inquiries about it; but he did not know whether or not it was coming into the market as a commercial commodity. He was glad to hear that the quantity of coke used was 40 lbs. per 1000 cubic feet, because he did not think this was generally known. The quantity of water gas which Mr. Terrace put in—25 or 30 per cent.—was, he thought, a limited quantity, compared with some places.

Mr. TERRACE, replying, said there seemed to be a great divergence of opinion as to the use of the relief holder. Mr. Ford showed clearly that they must have it—that was to say, they were not always producing gas, and they wanted to work the other plant the time they were "blowing" as well as the time they were manufacturing. They would understand from the lines of piping on the diagram how he dealt with the two gases. Mr. Ford put his carburetted water gas into the relief holder, and dragged it out from there in connection with the coal gas. He himself measured his carburetted water gas by a separate meter before mixing it with the coal gas; while Mr. Ford measured it by the coal-gas meter. His own system was supposed to be the more complete of the two; it enabled them to know better what they were doing. As they had heard from Mr. Ford, he put down a single plant, which he intended should tide him over present circumstances; whereas at Middlesbrough they had put down a more complete plant. As to the question of the segregation of the gases—that was to say, whether they would keep by themselves—he had found no difficulty whatever. The two gases had nearly a mile to travel together before they reached the holder; and he never found that they separated. As to the question of illuminating power, he found that they obtained the full duty of the gas. They themselves tested it at the works, and the Borough Analyst tested it in the borough—taking it from the distribution mains, at such a distance from the works that he was bound to get a general average. Therefore he (Mr. Terrace) did not think that any doubt could be cast on the gas, in the way of condensation destroying any of its illuminating effect. Remark had been made about an engineer in the North having thrown cold water on the gas; but he thought that in the place referred to they had so small an installation it could not be of much effect.

Mr. BOWER asked if (say) there were half a million cubic feet of carburetted water gas in the relief holder, and a million cubic feet in the coal-gas holder, they had any means of measuring the gas out of the relief holder, or any check upon the quantity sent out to the town?

Mr. TERRACE pointed out that in his case the gases were measured just before they mixed. As to oil tar, they made a very small proportion, and it was sufficient to keep up steam in the boilers for working the generators and driving the pumps and the blowers in connection with the carburetted water-gas plant. Unless they received a good price for it—something like 16s. per ton—it was not worth while selling it. But they were only offered about half this sum; and so they resolved to burn it. Mr. Drury had referred to the calorific value of the gas. In the mixture they used they had only had a difference of about 1¼ per cent.; and they had had no complaint from users of gas-engines, although they had something like 50 or 60 of them in Middlesbrough—some of them of about 200-horse power. They had about 8 per cent. of carbon monoxide in their ordinary coal gas; and using 25 or 30 per cent. of carburetted water gas, containing 30 per cent. of carbon monoxide, they had about 16 or 17 per cent., or nearly double. Mr. Gibb would observe by the paper that by the use of inclined retorts at Middlesbrough the cost of making coal gas was reduced from 10·68d. to 7·34d. per 1000 cubic feet.

Mr. C. DRU DRURY, of Sunderland, read the following paper on

ECONOMICAL METHODS OF RAISING STEAM IN GAS-WORKS.

Engineers and managers of gas-works often have it cast up against them that they, who are always urging the use of gas-engines among manufacturers, do not themselves use them—or, at any rate, employ them only to a very limited extent. If gas companies, it is said, who can have their gas at cost price, do not use it as their motive power, how can the public in general be expected to take it up?

While sympathizing with these sentiments to a large extent, the cause for the reproach is not difficult to find. Steam is an absolute necessity in a gas-works of any size. It is required for steaming out the mains and various portions of the works plant, and also in connection frequently with the revivification *in situ* of oxide of iron in purifiers, and, where sulphate of ammonia is manufactured, for boiling the liquor. In winter, of course, its usefulness is increased, as there is the meter-house to maintain at an even temperature, and also the prevention of freezing in the lutes of purifiers and gasholders, &c. These uses for steam are, however, more or less intermittent; and it is found more economical and practicable, since boilers are required, to make them large enough to provide steam for the daily requirements—such as the driving of exhausters, pumps, &c.—as well. Also the growing practice amongst gas engineers of manufacturing water gas on their works increases the demand for steam; and thus it comes to pass that even in newly-constructed works, in spite of the adaptability of gas-engines and the great improvements that have been made in them, steam is still employed as the great motive power.

But there is another point of view from which to look at this question of steam using, and one which, in my opinion, is most important—viz., the *cheapness* with which steam can be raised in gas-works. A certain quantity of dirty or small fuel is, like the poor, always with us; and this is either valueless and has to be carted away—perhaps at considerable cost—or commands so small a price as to be practically unremunerative. This can, and should, be used for raising steam. Now what is the fuel which can be dealt with as suggested?

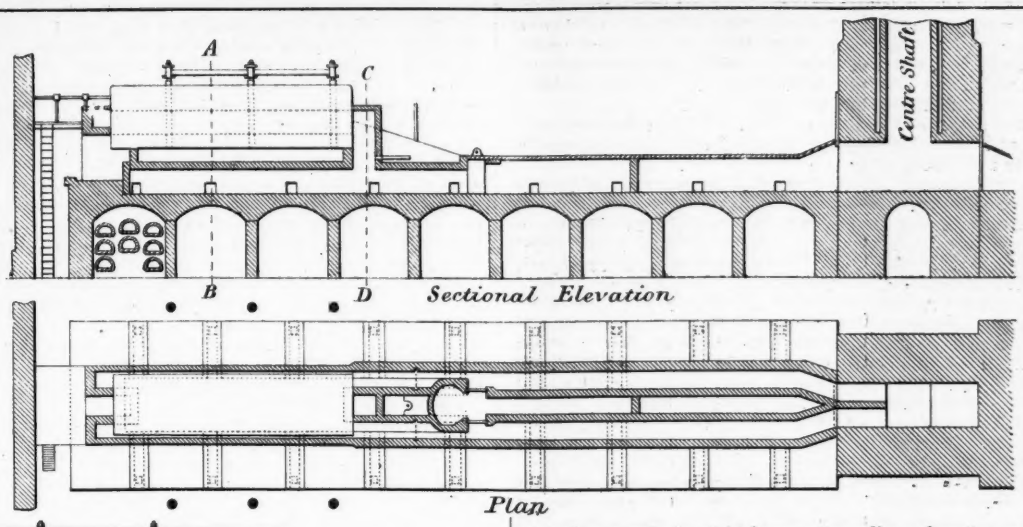
First of all—and there should not be much of this class in a well-regulated gas-works, although it mounts up when taken over a year's working—there is the coke swept up in the yard, or thrown up from the railway siding, or picked out from the furnace ashes. It is not advisable to mix this with the best coke, as it is generally small, wet, and dirty, and leads to tiresome complaints on the part of customers. In many cases, too, the pan breeze screened from the furnaces is added; and this, of course, reduces the cost of carting away the residual ashes. But unless there is ample accommodation for carrying on the operation, this process is somewhat inconvenient.

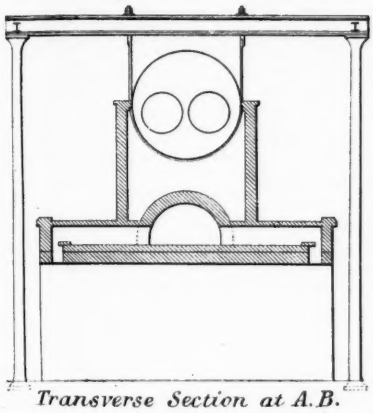
Next there is the coke breeze, which rarely fetches more than 1s. 6d. per ton, and except in a few favoured localities is very difficult to dispose of. When burnt, however, by means of a forced draught in a special furnace, of which there are several varieties in the market, it forms an excellent fuel for boiler purposes. No attempt will be made to describe a breeze-burning furnace in detail, as no doubt every member of this Association has either seen them in operation or has one or more of them at work himself. I regret that I am unable from practical experience to give any figures showing the working results of any such furnace. I understand, however, that an evaporative duty of from 5 to 7 lbs. of water per pound of breeze is claimed for them; and there is little doubt that where a plentiful supply of breeze exists—and such, of course, is the case in gas-works—the outlay necessary for a breeze furnace is a profitable one.

A third method of raising steam economically (and the description of this is really the essence of this paper) is that of heating the boiler by means of the waste gases from the retort-settings. And here I would beg leave to mention that, in bringing this method before the notice of the members of the Association, I make no claim for originality or for the introduction of anything novel. I merely wish to refresh their memories on the subject, and to draw their attention to the simplicity and economy of the process. I quite anticipate that many present will consider this plan of raising steam obsolete, since, owing to the very general adoption of regenerative (or more properly, recuperative) furnaces, there is not sufficient heat in the gases leaving the setting for the purpose; and also that it will be said that it is more desirable to utilize as far as possible all the furnace heat in the setting itself, than to produce more than is required and use the balance for some other purpose. To this I, to a great extent, agree, as I am a firm believer in the advantages and merits of generator, if not regenerative, furnaces—especially on the points of ease in regulating the heats and increased life of the retorts. But for all that, there are many works where it is not expedient or advisable to convert a whole retort-house of direct-fired settings to the more improved principle, especially if the existing furnaces are doing good work.

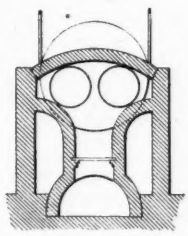
In the works at Sunderland under my charge, the whole of the settings are on the direct-fired principle; but in spite of this fact, the amount of coke (not coke and breeze) sold per ton of coal carbonized amounts to 10½ cwt. taken over a year's working. This result is largely due to the fact that the greater part of the steam used on the works is raised in boilers heated by the waste furnace gases, by which means the settings affected are, in a sense, converted into the regenerative type. There are at present three boilers heated in this manner; and a fourth is in course of erection. Of the three, two are tubeless, cylindrical, egg-ended boilers, 4 feet in diameter and 36 feet long, while the third is a Lancashire boiler 27 feet long. Experience shows that the latter type is by far the most efficient.

The system of overhead gas-fired boilers was introduced into the Sunderland works by one of my predecessors, Mr. J. T. Jolliffe, a former member and Past-President of this Association; and with a few modifications, the system is still worked in the same manner.





Transverse Section at A.B.



Transverse Section at C.D.

A glance at the diagram on the wall will show that the boiler is hung, so as to prevent its weight being carried by the arches of the settings, and thereby distorting them, from cross girders supported by cast-iron columns rising from the ground on each side of the bench; the only extra weight falling on the beds being that of the walls enclosing the boiler-flues. The bench over which the boiler is suspended consists of nine settings of eight through retorts each, of which the arches are 8 feet wide by 19 feet long. Of these nine settings, seven are connected to the flues of the boiler. It is found that the waste gases from four settings are sufficient to work the boiler satisfactorily. But, of course, better results can be obtained with the heat from seven beds; and this arrangement allows of the settings being let down in two's and three's for repairs, without laying off the boiler. The course of the waste gases is from the main flue through the tubes returning under the bottom of the boiler to the chimney. Dampers are provided for bye-passing the boiler altogether, when it is required to lay it off for cleaning, &c., in which case the gases pass away direct to the chimney.

The dimensions of the boiler are as follows: Length, 27 feet; diameter, 7 feet; the two tubes being 2 ft. 6 in. diameter. There are no cross tubes. The following fittings are provided: One 3-inch dead-weight safety-valve; one compound steam and low-water safety-valve; one 6-inch steam stop-valve; one 2½-inch feed-valve; one 2½-inch blow-out valve; one steam pressure-gauge; two glass water-gauges, placed so that when the water in the boiler is 3 inches above the tubes, it is just in sight in the glass; one ¾-inch brass tester-cock; one manhole; and one mudhole. There are, of course, no fusible plugs, as they would be quite useless in this case. A small duplex feed-pump is fixed in the retort-house, close to the boiler, for supplying the water; and the gauge glasses are placed in such a position that they can be easily seen by the retort-house foreman, in whose charge the boiler is placed, and who is paid a nominal sum for looking after it. His duties consist in regulating the feed-water supply, and in sludging the boiler once per shift.

The cost of such a boiler erected and set is as follows: Boiler and fittings, £270; columns and girders, £126; erecting and setting, about £130; feed-pump, about £24—or a total of £550. The extra cost of suspending is, of course, much more than compensated for by the fact that no house or chimney are required to be erected.

A number of experiments were made to ascertain how much work could be got out of this boiler when the waste gases from seven settings were being passed under it, with the following result:—

Duration of test	8 hours.
Water evaporated	1890 gallons.
Temperature of feed water	48° Fahr.
Average pressure of steam	32 lbs. per sq. in.

In other words, in eight hours 18,900 lbs. of water were raised from 48° to 276¾° Fahr., and evaporated at this temperature. The next step was to find the amount of coke which would have been necessary to do this work; and not considering it sufficiently satisfactory to assume an evaporative duty per pound of coke, experiments on the same lines as the preceding were made with a hand-fired Cornish boiler 20 feet long by 5 ft. 6 in. diameter—diameter of tube, 3 feet. Results were as follows:—

Duration of test	8 hours.
Water evaporated	1870 gallons.
Temperature of feed water	52·5° Fahr.
Average pressure of steam	30·5 lbs. per sq. in.

Or in eight hours 18,700 lbs. of water were raised from 52½° to 274½° Fahr., and evaporated at this temperature. The amount of coke consumed during the period was carefully weighed, and proved to be 1 ton 21 lbs., from which it was found that 8·27 lbs. of water were raised through 222° Fahr. and evaporated by 1 lb. of coke. The fuel used was best coke, brought straight from the retort-house, but not selected in any way.

Correcting the figures obtained in the experiment with the Lancashire gas-fired boiler to the temperatures in the latter experiment, the weight of water evaporated works out to 18,975 lbs.; and therefore the amount of coke saved in eight hours on the preceding basis is 1 ton 1 qr. 26 lbs., or about 20 tons per week of 6⅔ days.

Besides the value of the coke, there is also saved the greater part of an attendant's wages; and assuming the cost of labour that would be required to be equal to 4s. 6d. per day of 24 hours, and taking the value of coke at the low price of 6s. per ton, the actual saving per week by this gas-fired boiler is—

Coke saved, 20 tons, at 6s.		£6	0 0
Labour saved, 7 days, at 4s. 6d.	£1 11 6		
Less Foreman's allowance	0 10 6		
		1	1 0
Total saving per week		£7	1 0

Now the retort-settings are under fire for an average period of 33 weeks in the year; and therefore the total saving per annum by this one boiler is £232 13s.

Here I may say that, though due care was exercised, and the necessary precautions taken to avoid error, the foregoing experiments were conducted on strictly "working" lines; and the results are such as may be obtained any day of the week. It may be urged that a fair comparison cannot be obtained between a 27-feet Lancashire boiler and a Cornish one 20-feet long; but I feel sure, at any rate, sufficient evidence has been produced to show that the economy effected is not inconsiderable.

To complete the information respecting the gas-fired boiler, temperatures of the waste gases were taken in the main flue before and after passing under the boiler. A number of tests were made; and the results varied according to the condition of the fires in the settings. But all showed that the boiler effected a reduction in the heat of about 700° Fahr.

The temperature before passing under the boiler varied from	1337°	to	1130°	Fahr.
Do. after passing under the boiler	645°	,,	429°	,,
Difference	692°	to	701°	Fahr.

The above temperatures were obtained by means of a Siemens' water pyrometer; and to those requiring such an instrument, it can be highly recommended for reliability and simplicity of working. Perhaps it will not be considered out of place if a brief description of it is here given.

The pyrometer consists of a cylindrical copper vessel, containing a second smaller copper vessel with double walls. An air-space separates the two vessels, and a layer of felt the two walls of the inner one, to prevent radiation of temperature. The capacity of the inner vessel is a little over one pint. A thermometer is fixed close to the wall of the inner vessel; its lower part being protected by a perforated brass tube, while the upper projects above the vessel, and is divided into degrees

Fahrenheit or Centigrade, as desired. At the side of the thermometer is a small brass scale, which slides up and down, and on which the high temperatures are marked in the same degrees as those in which the thermometer is divided. On a level with the zero division of the scale, a small pointer is fixed, which traverses the scale of the thermometer. Short cylinders, of either copper, iron, or platinum, are supplied with the pyrometer, which are so adjusted that their heat capacity at ordinary temperature is equal to one-fiftieth that of the copper vessel filled with one pint of water.

The method of using the instrument is as follows: Exactly one pint of clean distilled or rain water is poured into the copper vessel, and the pyrometer left for a few minutes to allow the thermometer to attain the temperature of the water. The brass sliding-scale is then set with its pointer opposite the temperature of the water, as shown by the thermometer. Meanwhile, one of the metal cylinders has been exposed to the high temperature which is to be measured; and after allowing it time to acquire that temperature, it is rapidly removed and dropped into the pyrometer vessel, without splashing any of the water out. The temperature of the water will now rise; and after the thermometer has become stationary, the degree is read off, as well as that on the brass scale opposite the top of the mercury. These two values added together give the temperature to which the cylinder has been exposed. With copper and iron cylinders, temperatures of 1800° Fahr. can be measured; but with platinum cylinders, the limit is 2700° Fahr.

In course of time, the copper cylinders lose weight by scaling; and a table is supplied with them with corrections for the diminished weight.

Before concluding, I earnestly trust no one will consider that there is the least intention in this paper of disparaging the gas-engine, or of throwing doubts on its usefulness in gas-works. On the contrary, I would strongly advocate its use in every gas-works, provided that a supply of steam is also obtainable; and on those works where only steam-engines are employed, a gas-engine should be introduced at the earliest opportunity, if only to encourage the use of it by others. That gas-engines may be used wherever steam-engines are employed, needs no demonstrating; and even in the delicate and fluctuating work of driving an exhauster, a gas-engine may be safely and economically made use of, as Mr. Dunn at our last meeting so ably showed, by means of his ingenious contrivance.

I have a fear it may be felt that, apart from its want of novelty and originality, this paper has, if not a backward tendency, a more or less ancient flavour. But I make no apology; for history repeats itself, and the old fashions of yesterday become the new ones of to-morrow.

Discussion.

The PRESIDENT thought they might congratulate themselves upon having had that day two eminently practical papers. He did not think that Mr. Drury should have made any apology with regard to his paper, because it was full of new information—at least it was so to him. It contained a number of facts which would be useful to every one of them in their ordinary everyday work.

Mr. E. H. MILLARD (Durham) said he had known two places where the method of raising steam as described in the paper had been in use. They were both works considerably smaller than Mr. Drury's. He himself had had practical experience with one, where there was an egg-ended boiler; and it was not satisfactory. In the summer time there might be three or four beds of retorts at work, and there was not sufficient heat to generate steam. In the winter time, with the extra draught which was required to be put upon the beds, there was absolutely no economy in the raising of steam in this way. He was surprised that in such a place as Sunderland it should be considered that this was equal to a regenerative system in the saving of fuel. Mr. Drury's results were, however, very good; and perhaps the price he got for coke did not commend the other system to him. But he (Mr. Millard) should think that economy in heating could be better obtained by means of regenerative furnaces, than by raising steam in the way described. The boiler was certainly not in a convenient place for working.

Mr. A. C. HOVEY (Tynemouth) enquired of Mr. Drury whether 32 lbs. was the maximum pressure he was able to maintain by a boiler fired in this way; and, if it was the maximum pressure, if it was the pressure he employed in his works, and if all his machinery was suitable for such a low pressure. He should also like to ask the minimum number of beds he could fire the boiler with; and he should like to draw attention to the distance which the boiler would probably be from the engine-house, and the great drop in pressure there was likely to be, owing to the distance the steam would have to travel.

Mr. HERBERT LEES (Hexham) expressed his appreciation of the paper Mr. Drury had brought before the meeting. He could do this the more heartily as he had the opportunity some years ago of placing the other side of the question before the Association—that was the production of motive power by means of gas-engines. He thought an arrangement of the sort referred to in the paper would be no use in a works of (say) from 10 to 14 millions per annum; but he had no doubt that the facts which Mr. Drury had put before them fully justified his adoption of it. Of course, Mr. Drury had told them that he approved of regenerative furnaces; but, taken altogether, the results at Sunderland were so satisfactory that they could afford to consider the matter on its merits. He was very glad that Mr. Drury had brought the subject before them. It would be no use to any of them in small works, because at some seasons they would only have one or two beds of retorts working, and, even with a very small boiler, he presumed that sufficient heat could not be obtained by the method described. A gas-engine also did away with the need for a boiler fireman. Where a man had to be kept to look after the boiler, his (Mr. Lees') experience had brought him to the conclusion that they could work more economically with gas. However, there were both ways of working; and they all wanted to look at these matters from their own standpoint. When they could do this, and could bring to bear on the subjects all the information they could get, they should probably be able each to adopt what would be suitable in his own case.

Mr. W. FORD (Stockton) complimented Mr. Drury on his paper. Some little time ago, he was travelling in Yorkshire in search of electric lighting, and he came across an instance where the whole of the heat required to drive the installation was obtained in the way shown; so that, if they got the heat Mr. Drury did, he could only say the matter was worth their attention.

The PRESIDENT said he was at one with Mr. Lees as to its being considered old-fashioned to continue direct-fired furnaces. He had the two kinds in his works, and he was not quite sure that he could not get as good results out of the direct-fired furnaces as he did out of the regenerators. It might be rather a retrograde remark to make in the year 1898; but he did not know that there were not two sides to the question, and he thought that if Mr. Drury were obtaining the good results he was doing by direct-fired furnaces, and utilizing the heat in this way, he was probably getting compensation for the heat which would be used in a regenerative system. As to the disposal of breeze, in Scarborough they sold the whole of it to the electric light people for generating steam. They were proposing to put in a destructor, by the aid of which they were to supply electric light at something like nothing per unit; and he supposed he would have to look for another market for their breeze when that time came.

Mr. DRURY, replying to Mr. Millard, said he did not for a moment contend that this was nearly so good a way of recovering heat as was a regenerative setting, which he thought was far better, from a good many points of view; but when he found two houses of retorts, and knew that it would require a large sum to convert them into regenerative settings, and that the erection of this boiler would get them the heat in a simple way, he thought he was justified in adopting this system. They were selling 10½ cwt. of coke per ton; therefore he thought he was justified in continuing this method of raising steam. He was asked about the pressure of steam. The maximum was 32 lbs.; and all his machinery was arranged for working at it. No doubt, if a time came when they should raise the pressure, the boiler could be worked at 50 lbs. The minimum number of beds to be used was four. They were throughs. With less than four beds, they would make such wet steam that it would not be workable. Of course, there were disadvantages in having a boiler like this, in that they had sometimes to work settings which were not conveniently situated relative to the boiler. But as he was going to have two Lancashire boilers, he would get over this difficulty pretty well. As to the distance the steam had to travel, they used steam for so many purposes and in so many places that it really did not much matter where they put the boiler. They would, no doubt, raise a good deal more steam than they did, if they arranged the flues for this purpose; but the first consideration was not to damage the beds in any way, or reduce their heat, by altering the flues. They made their beds so as to work as economically as they could; and then they used the waste heat of the gases. He was much surprised at one time, to be told that when the boiler was at work there was a better draught on the settings than when it was off. The reason for this he found to be that, when the boiler was off and the dampers were closed, there was behind the dampers an accumulation of dust and dirt which contracted the flue. He thought every gas-works should have a boiler which would burn up their breeze.

THE WORKMEN'S COMPENSATION ACT.

Mr. T. BOWER (West Hartlepool) said they were all probably aware that on July 1 next, there would come into force the Act called the Workmen's Compensation Act, 1897. The Company he represented had been making inquiries as to what would be the best method of dealing with their liabilities under the Act. There seemed to very considerable doubt as to what were the best steps to be taken; and it was more with the view of stating how far they had gone in the matter, and what they contemplated, that he thought it would be desirable to bring the matter before the present meeting, in order that members of the Association might look more fully into the question and consider what would be best to be done, both individually and on behalf of the profession they represented. There seemed to be great doubt, in the first instance, as to what their liabilities were under the Act. This was shown by the fact that some of the largest insurance companies in the country were quoting premiums as high as 25s. per cent. of the wages paid by gas companies. If such a sum were to be paid, it would be a considerable tax upon gas companies in the future. He was told

that the 25s. rate came from an association of insurance companies, who had banded themselves together, he presumed for their own protection. Perhaps they fixed the price more as an experiment, in order that they might see what the result would be. He had no doubt but that they knew very well how to take care of themselves, and that they had fixed a margin which they considered would cover any risks which might arise under the Act. But there were other insurance companies who were not in that federation, and who considered that 15s. per cent. was quite sufficient to cover their risks. In the case of his own Company, the whole of the risks they had incurred for several years back had not amounted to more than 2s. per cent. The risks might be greater under the new Act; but personally, he did not see that they should be very much greater. In all cases of accident, his Company had paid the men half their wages during the time they were off. This was, practically, what was provided under the Act. He very strongly objected to being taxed to the tune of 25s. per cent., when, without any prejudice in the matter, he found that they had not paid more than 2s. per cent. in the past. To his mind, it resolved itself more into a question of whether gas companies should play into the hands of the insurance companies, or whether they should take such steps as would mutually protect themselves. It did not seem to him to be unreasonable that gas companies should form an association of their own, which everyone might join, and so they might participate in the advantages which the insurance companies would otherwise obtain if gas companies insured with them. It occurred to him that it would be a desirable thing that some such steps should be taken, so far as the gas industry was concerned. Of course, the question came up, who was to take these steps? He mentioned the matter that day, because he knew that other associations were on the track. For instance, the Federated Marine Engineers at York had that week decided that such an association should be initiated in their industry; and they had gone so far as to fix rates, which were not to be more than about 10s. per cent. Now, if the Marine Engineers could get their risks insured for 10s. per cent., he did not see why gas-works should have to pay 15s. or 25s. He wished every manager himself to look into the matter; and he would suggest that, so far as their Association were concerned, they might safely appoint (say) the President and Secretary to deal with the matter, if perchance it should be mentioned by other Associations, and to deal with gas interests generally so far as the North of England was concerned. He did not think that anything more need be done in the matter at present; but it did seem to him to be a pity that, because nobody was looking into the question, they should be charged 15s. or 25s. per cent. for a thing which would not be anything like represented by the benefit to be derived from the payment. He should certainly like to see something done with regard to general steps being taken. He should have stated that liability was not confined to the Act alone; there was the old liability under the statute, and there was also liability at common law, all of which required to be taken into account. But still, when all was said and done, he thought the rates proposed were much too high. He admitted that the insurance companies had no gauge as to what would be the possible risk under this Workmen's Compensation Act; but, on the other hand, when all allowance was made for this, he thought the rates proposed were too high, and that it was a matter which gas companies might look into and form a scheme for their own protection.

Mr. J. WHYTE (Seaham Harbour) said he was very glad that Mr. Bower had introduced the subject. He had been asked to do so, with a view to seeing whether gas managers would not agree to the combining of districts in a matter of this kind, and thereby receive the benefits of insurance much more cheaply than they would by insuring with companies. He thought if gas companies would join together, the thing could be done.

Mr. E. H. MILLARD (Durham) remarked that the matter had already been under consideration in his district. His Chairman was also connected with two other companies; and a meeting of the Directors of the three had been fixed, at which they were to consider whether an arrangement to combine could not be made. Mr. Bower was entitled to their thanks for introducing the subject.

Mr. W. HARDIE, jun. (Tynemouth) said the subject had also exercised his mind a little. He had had several communications upon it with other members; and the general feeling seemed to be that very large works might insure themselves, but that in the case of small works it would be a very unsafe thing to do. He did not agree with Mr. Bower when he said that the risks under the new Act would not be much greater than under the old one. He believed they were very much more severe. Some such scheme as this had been suggested several times in connection with other matters. Mr. Bower had done them a service in bringing the question forward; but if it were to be treated as it had been that morning, and they were to leave the room without anything more being done, the probability was that no good would come of Mr. Bower's proposal. It was possible that a scheme of the kind would take a good deal of time to work out. The Act came into force in July; and if they left the subject where it was, they would not be any better. He certainly thought that any small gas-works which took the risk of the Act on its own head would be running a very great danger.

The PRESIDENT said his understanding of Mr. Bower's proposal was that the President and the Secretary should be appointed to confer with any other Association, or the Parent Associations, on the matter, if occasion arose.

Mr. BOWER thought that Mr. Hardie was quite right, and that it was desirable that they should go a little farther than discuss the subject. He proposed the following resolution: "That the North of England Gas Managers' Association resolve to confer with all other Associations, with a view to some ultimate steps being taken for the formation of some mutual insurance society; and that the President and Secretary be empowered to deal with the matter in future." This might lead to some steps being taken which would not otherwise be done. At the same time, he should like to correct one thing which Mr. Hardie had said. When he spoke of the risks under the new Act not being greater than under the old one, he was alluding to the risks which his Company had experienced—that was to say, they had given compensation where they were not compelled to do so. Risks had been met, and charges incurred by his Company in the past, more than need have been. It had always been the practice of his Company to pay liberally to workmen who might have been injured. This, he thought, was the tenor of the new Act; and the only additional liability which would be imposed upon his Company would be compensation for death, which was not to exceed three years' salary. So that he looked on it that the risks of his Company would not, in the future, be so great as seemed to be anticipated.

Mr. J. WHYTE seconded the resolution.

Mr. E. H. MILLARD said he was rather afraid that to make the movement a national one was to place it beyond the range of practical politics; and he would propose that the movement be confined at first to the members of the North of England Association. He thought they would the more readily get into working order in this way; and the movement might possibly later on go further.

This amendment was not seconded; and Mr. Bower's resolution was adopted.

The PRESIDENT said that so far as he was concerned, the insurance companies were proposing to increase his premium by about 1150 per cent. The risks would be a good deal greater; but it seemed that the burden they were proposing to place upon gas companies was much larger than need be.

THE STANDARDIZING OF METER UNIONS.

Mr. W. HARDIE, jun., said they had received a communication from the North British Association of Gas Managers, asking if the Association would join them in trying to get a uniform standard for meter unions established. Everyone knew the inconvenience there was with the meter unions as at present; the meters of one maker not being the same as those of another. The North British Association, during the past year or two, had been going very fully into this matter with the meter makers; and they had prepared a set of standards, which they submitted to the Board of Trade. But they were rather surprised to find that the Board of Trade had already in their possession a complete standard set. Since then the matter had been in abeyance; but it now seemed to be the general idea, both of the North British Association and of the meter makers, as well as of the Standards Department of the Board of Trade, that if a standard were adopted it should be one generally suitable. The North British Association asked this Association to send representatives to a Committee to assist in carrying the matter through. It was certainly desirable that meter unions should be of uniform size; but, so far as he could see, there appeared to be no opposition in the matter, and whether or not it were advisable for their Association to send a deputation all over the country, to spend money and time upon it, was a question upon which it might be better to hear the opinions of some of the members.

Mr. BOWER: Could that not be done by correspondence?

Mr. HARDIE: I should think that if the meeting be in harmony on the matter, it should not be necessary to send anyone—at least, that is my own feeling.

Mr. HERBERT LEES thought the Association ought to be represented in the matter. He moved that the President and Secretary be appointed to represent them.

Mr. J. WHYTE seconded the motion. He thought it would be a very great acquisition indeed, so far as he could see from what had taken place; and he did not think the meter makers were averse to the proposal, but rather in favour of it.

The resolution was carried unanimously.

VOTE OF THANKS.

Mr. W. DOIG GIBB moved a vote of thanks to the readers of the papers.

Mr. J. H. COX (Sunderland) seconded, and the motion was agreed to.

ELECTION OF OFFICE-BEARERS.

The PRESIDENT intimated that the ballot had resulted in the election of the following gentlemen to be office-bearers during the ensuing year:—

President.—Mr. C. Dru Drury, of Sunderland.
Vice-President.—Mr. W. Doig Gibb, of Newcastle.
Auditor.—Mr. Herbert Lees, of Hexham.
Hon. Secretary.—Mr. J. H. Penney, of South Shields.
Committee.—Mr. T. Bower, of West Hartlepool, and Mr. W. Ford, of Stockton.

Mr. DRURY returned thanks for the appointment.

It was agreed that the next meeting should he held at Sunderland.

A vote of thanks was accorded to Mr. Holliday for his services; and the proceedings terminated.

The members and their friends afterwards dined together in the County Hotel—Mr. Holliday presiding. The toast of "The North of England Gas Managers' Association" was proposed, in a speech couched in a happy vein, by Mr. E. W. T. Richmond, who felicitously referred to the fact that the Association had attained its majority; that there were still many members in it (a number of them being present) who joined the Association when it was created twenty-one years ago; and that they all regretted that Mr. W. Hardie, who till last year was Secretary of the Association from its commencement, should have been unable to remain in office till that day. He also alluded to the hopeful future which was before the Association, as attested by the fact that so many young members were taking an active part in its affairs.

THE YOUNG AND GLOVER SYSTEM OF REMOVING NAPHTHALENE AND CARBURETTING GAS.

Readers of the "JOURNAL" will doubtless remember that one of the papers read at the last meeting of The Gas Institute dealt with the subject of the prevention of naphthalene deposits in conjunction with the carburetting of illuminating gas. It was the joint production of Mr. W. Young, of Peebles, and Mr. T. Glover, of West Bromwich. We learn from the last-named gentleman that, from experiments made on a working scale, he received sufficient proof that the proposals set forth in the paper were sound in practice, and that economical enrichment could be obtained, and complaints of naphthalene largely, if not completely, abolished, by carbonizing a proportion of coal, or coal and cannel, at a distinct temperature for the production of rich hydrocarbons, and introducing it to the coal gas at a point in the condensing apparatus where the risk of their subsequent absorption in the coal tar is avoided. Mr. Glover states that the enriching value of a ton of cannel, when used by this process, is more than doubled, as proved by four months' continuous work at St. Helens, where, under the supervision of Mr. S. Glover, the necessary plant has been installed for its permanent use. During this time, the naphthalene complaints, which were previously both numerous and persistent, have gradually disappeared; while the cost of enriching the coal gas to 19-candle power has been reduced to about half what it would be by the use of oil gas. This success has led Mr. T. Glover to recommend his Committee to adopt the process; and he has received instructions to spend up to £100 in making the necessary alterations of his plant during the coming summer, though he does not anticipate that the whole of the sum will be required. He adds that arrangements are being made for a trial of the process in another large provincial works.

GAS-ENGINE RESEARCH.

Professor F. W. Burstall's first report to the Gas-Engine Research Committee of the Institution of Mechanical Engineers was again under consideration at the ordinary meeting on Wednesday last, at the Institution of Civil Engineers. The principal portions of the document, with a report of the discussion which followed its presentation at the previous meeting, were published in the "JOURNAL" for Feb. 22; and we now give an account of the further discussion which took place on Wednesday.

Professor BURSTALL submitted a supplemental statement to the report. He said the experiments must not be regarded as conclusive. They were undertaken mainly to find out the directions in which future economy tests should be made; and were therefore carried out with a greater number of variations than would be desirable if the experiments were intended to prove a general law. Previous experiments, in which the amount of air was measured, had been carried out on engines in which the volume of compression could not be varied. The best known of these experiments were made by Dr. Slaby on an "Otto" engine using flame ignition. The amount of compression was small; and therefore the ratio of air to gas could be varied only between 5·5 and 7·5. The engine ran without the use of the governor—that was to say, no explosions were missed. It therefore seemed that one of the objects of the present series of tests should be to extend the scope of the experiments in directions in which Dr. Slaby, owing to the construction of his engine, was unable to proceed. The experiments which were now being carried out, and which would form part of a subsequent report, were at a constant speed. The quantities which were being varied were the load, the ratio of air to gas, and the compression. It might be noted, however, that thus far they bore out the first experiments in drawing attention to the advantages of using a suitable mixture, and in showing the importance of making an accurate analysis of the exhaust gases.

Mr. H. R. J. BURSTALL, one of the members of the Committee, thought it would be well if he made a few remarks as to the object of the experiments. In obtaining information as to the efficiency of gas-engines, they had so far had to rely on tests made by experts and gas-engine manufacturers. But in most cases they were only made under a particular set of conditions for a particular engine working in a particular place. In trying to get out any laws from a set of experiments of this class, one found as many gaps in a line as there were places filled up; but in the experiments which the Committee had undertaken, the object was to fill up as many gaps as possible, so as to enable an ordinary gas engineer to find out what happened when he did a certain thing to an engine—that was to say, supposing he had an engine working under given conditions, their object was to enable him to find out just what he would have to alter to make it work equally well under different conditions. For instance, he knew of an engine that was tested with gas made from good gas coals; but on being taken over to Belfast, where the coal gas was mixed with water gas, it worked altogether differently. The object of the Committee was to put the thing on a broader basis, and to find out, and make public, the laws which would be generally applicable. He had no doubt these laws had been found out by gas-engine manufacturers; but they had not been made public. In making the arrangements for the experiments, special care had been taken; and the apparatus had, as far as possible, been designed to give an accuracy somewhat on the scale of the instruments used in a laboratory—the reason being that it was seen that the number of tests to be made would be, comparatively speaking, very great; while the time at the disposal of the reporter was comparatively small. By increasing the accuracy of the apparatus, they were enabled to cut down the length of the trials so that a great number of tests could be made. With regard to the criticisms at the last meeting, he was much struck by the statement of Mr. Dugald Clerk that it was impossible to get a reliable result from a small gas-engine, with an indicator on. He (Mr. Burstall) was afraid this must be taken simply as an expression of opinion. The inference was that so much leakage occurred through the indicator that the consumption of gas was too high. Working out the figures in the report, it would be found that the indicator cards were taken every five minutes, and the engine was running at 200 revolutions per minute; and if they lost the whole of one cylinder full of gas, they would only have an error of 1·50th of 1 per cent. The indicator used was of very small capacity—something under a cubic inch; while the capacity of the cylinder was several hundred cubic inches. As to the loss due to the timing-valve, it would, he thought, be of about the same magnitude. One important fact had been brought out, which was that they were able to determine the actual ratio of air to gas in exactly the same way as they had been able to determine the quantity of air used in the furnace of a boiler—that was, by an analysis of the exhaust gases. If they knew the analysis of the gas (as they must do if they carefully sampled and analyzed the exhaust gases, which was a simple thing to do), they could then calculate, with considerable accuracy, the actual ratio of air to gas. This was an important point. It was not near enough to assume that a gas-engine cylinder was filled with air and gas. It assumed that they knew the temperature at which the air was taken into the cylinder. They did not know this; but the Committee hoped to do so, as it was one of the points to which they were directing attention. With their small engine, they were able to measure the actual quantity of air used; but they could not do this with an engine of (say) 25-horse power. The determination could be made by simple chemical methods; and if the labours of the Committee only proved this, he thought that it was an important step to accurate gas-engine tests, and also as enabling them to get out a heat balance.

Mr. BRYAN DONKIN (who is also a member of the Committee) wished it to be clearly understood that Professor Burstall's report was only a preliminary one, and was by no means final. It only contained some seventeen experiments, a long description of the instruments, and the general programme for future experiments—in fact, it was merely the foundation for the real work of the future. Personally, he congratulated Professor Burstall on his preliminary report. It was a good beginning, as he had already solved many difficulties and problems. Referring to the published tables (see *ante*, p. 401), the indicated horse power in the seventeen experiments varied from 1¾ to 5; and the speeds from 118 to 204. With regard to the brake horse power, it would have been an advantage if it had been added; but it could, of course, be worked out from the mechanical efficiencies given. Perhaps this would be included later on. As to the sampling of the exhaust gases, Professor Burstall had solved the problem in a new way. It was a difficult matter; and it had seldom been done well and accurately. It was a very important thing to get a real representative sample; and particularly under mercury. The method adopted by the reporter appeared to be a good one to get the percentage of carbonic acid and oxygen. The maximum of carbonic acid by volume seemed to be only 9·3 per cent., and the minimum 3½ per cent. They, however, agreed well with the calculated quantity of oxygen. There was always a large excess of oxygen found in the exhaust gases; and perhaps in future experiments the Committee would be able to prove whether this large excess of oxygen was necessary. Experiment No. 15 gave 21 per cent.

thermal efficiency, and the carbonic acid was only 7 per cent.; and in experiment No. 17 the thermal efficiency was 18 per cent., and the carbonic acid was half—viz., 3½ per cent. by volume. So that they had a little less thermal efficiency, but only half the volume of carbonic acid. The best thermal efficiency was the one giving the maximum volume of carbonic acid. As to compression, in these seventeen experiments it was increased from 52 to 105 lbs. per square inch. More compression seemed generally to mean more economy and higher thermal efficiency; but not always. The speeds unfortunately were not always kept the same; so that it was difficult to make exact calculations. With regard to the varying proportions of volume of air to volume of gas, the best results in these experiments were with the proportion of 8½ volumes of air to 1 volume of gas; but here again the speeds varied somewhat. This was a very important point to determine in any engine; but it would no doubt vary in different sizes and types. It would be very interesting if these proportions of volume of air to gas could be plotted out in connection with the thermal efficiency. As to the question of the temperature of the exhaust gases, it had not been given (though it was an important point) in the preliminary report; but it would be taken in the future, and a heat balance would be worked out for each experiment. Professor Burstall told them that the mechanical efficiency was about 80 per cent.—that was to say, 80 per cent. of the indicated horse power equalled a brake horse power. The thermal efficiency in their small engine was lower than in a large one. The maximum thermal efficiency in the seventeen experiments was 21 per cent., which seemed very good. Of course, it was a comparative thermal efficiency that was wanted in this case; but it was an important point when one condition was varied at a time, and all other things were kept constant. Referring to the method of taking the diagrams, the sheet of smoked mica with the Wayne rotary indicator seemed a very practical system, and was certainly more accurate than the ordinary paper diagrams and the reciprocating piston indicator. He was sorry not to see the temperature of the cylinder walls mentioned in the report. He understood, however, that Professor Burstall intended to go into this important question—to take the temperatures of the cast-iron cylinder walls, of the flames, and of the gas in the clearance space. It was no doubt a difficult and tedious task; but the author was well able to tackle it. With regard to the heating value of the gas, he thought it would be wise to put in a gas calorimeter. Of course, they knew that the heating value of the gas in London, Birmingham, or any other town varied considerably from hour to hour. Another vexed question was that of the cooling-jacket water; and he should like the author to add in future reports the area of the internal surface touched by the flames and gas inside the cylinder, including the piston, &c.—that was to say, the area touched by the gas which was also touched by the water jacket.

Professor D. S. Capper (King's College) spoke of the difficulty of criticizing a preliminary report of this kind; and said that, in the discussion which took place at the last meeting, Professor Burstall suffered from the fact that the results given were only preliminary ones. He certainly had shown them an admirable example in the great care he had exercised in the calibration of the instruments used. This was the intrinsic merit of the report. Sufficient stress had not been laid upon the ingenious arrangement for taking curves on smoked mica; the ease and accuracy with which the results were obtained being truly remarkable.

Professor Kennedy, the Chairman of the Research Committee, said Professor Capper had properly interpreted the object of this report. The work so far had caused Professor Burstall an immense amount of labour; and the report was merely a preliminary one to show the nature of the work and of the appliances, before proceeding with the more elaborate investigations. Future reports would go much farther; and the experiments would be more systematically carried out.

Professor Burstall, in replying on the whole discussion, first explained that the reason more tests were not included in the report was because, when the apparatus was completed and in running order, he had to move his home from London to Birmingham; and consequently a great number of the conditions were varied. The low-speed tests were forced upon him, because the water motor which drove the fan for the air supply was connected with the water-mains, and at the particular time the mains would not give sufficient pressure to run at high speed; and consequently this caused some fluctuation. In his criticisms at the previous meeting, Mr. Dugald Clerk told them what a gas-engine should not be; but he did not indicate the directions in which his engine was deficient. It so happened that the engine was capable of being run with a junk-ring or without one at identically the same compression. He wished to draw attention to experiments Nos. 3 and 5. In No. 3 no junk-ring was employed; the compression being produced by packing pieces. In No. 5 a junk-ring was employed; but the packing was removed. The speed in No. 3 was 158 revolutions per minute and in No. 5, 204. The conditions were very nearly the same. The thermal efficiences were 15·5 and 15·6 per cent. The heat rejected to the jacket water was, in the case of No. 3, in which no junk-ring was employed, 31·8 per cent., and in the other case 37·1. Mr. Clerk also said that the use of an indicator on such a small gas-engine was detrimental to economy. He (Professor Burstall) had examined very carefully the whole of the published researches on gas-engines; and he had not found any mention of this error. In order to test this, he had run the engine for ten minutes without the indicator, and for a further ten minutes with it; but he was unable to detect any fluctuation either in the brake reading or gas consumption—the real reason being that the contents of the indicator were extremely small in comparison with the volume of the cylinder. He was rather inclined to consider that the use of the timing-valve was not altogether desirable; but it was almost forced upon them when using high compression. However carefully the height of the flame was set, there was always liability to premature ignition. But he did not think the error due to the use of the timing-valve was a serious matter; nor could he discover any discrepancy between experiments carried out with an open tube and a closed one. He was of opinion that on the whole the iron tube was the best for the purpose of ignition. Regarding Professor Robinson's remarks at the last meeting, the quantities of gas were corrected for pressure and temperature. The duration of the tests was half-an-hour, which he (Professor Burstall) considered was three times as long as was necessary for an engine of his type, because everything was perfectly steady. Junker's calorimeter was an extremely useful instrument when the gas had to be taken from the mains. But in these tests the gas was drawn into a gasholder; and therefore it was equal in temperature. It appeared to him that the whole of his results had been attacked because he ventured to say that economy depended on other conditions besides compression. Compression had been looked upon by the gas-engine maker as a sort of finality; but he had tried to show that there were other conditions to be taken into account. If time had permitted, he could have quoted a number of tests to show that an equally good result could be obtained with a compression of 52 lbs. or 105 lbs.

THE NEW WELSBACH BURNER.

The proclamation of Sir Henry Burdett at the recent statutory meeting of the Welsbach Incandescent Gas-Light Company as to the early advent of a new burner which would develop the remarkable efficiency of 30 candles per cubic foot of gas consumed, has been—and not surprisingly so—the subject of much comment and speculation in the gas profession; and many have been the inquiries for further information. But the Company were not immediately prepared to "show their hand;" and consequently we have been unable sooner to satisfy the curiosity of our readers. Now, however, we have seen the burner, and may at once confess admiration.

Before proceeding farther, it will be well perhaps to remove a little misapprehension which has been created by the obscurity that surrounded the statement made by Sir Henry Burdett as to the capabilities of the burner. At the present time, the Company are confining their attention to the production of a series of five burners, which are designed, at ordinary pressures of 6-10ths to 8-10ths, to consume a certain quantity of gas—ranging from 1 cubic foot in the case of the smallest burner to 6 cubic feet in the largest. The mantles, by the way, are made of a size suitable for the burners; those for the smaller ones looking quite diminutive compared with the mantles to which people have become accustomed. The ratio of light obtained with these burners, per cubic foot of gas consumed, is, at normal pressures, the same—practically 25 to 30 candles. This is a remarkable stride from the 50 to 60 candles obtained, with a consumption of 3½ or 3¾ cubic feet of gas in the old "C" burner; but the extraordinary feature is the fact that the ratio of efficiency is constant through the series of burners. With the old type of burner, when the Company attempted to make one to consume 2 cubic feet of gas, they lost efficiency; and with a burner made to consume 6 cubic feet, the efficiency per cubic foot diminished to a very great extent—the increase in consumption was out of all proportion to the increase of light.

The new burner is a special form of the bunsen type. The stem consists of a suction cone, which is connected with a second cone. The latter is inverted, so that, the two smaller ends being joined, a constriction is formed in the middle of the stem. The gas flows in the lower cone through a nipple; and the two cones have the effect of drawing in a much larger amount of air than is the case with the ordinary bunsen burner. The mixture of air and gas produced within the two cones is almost explosive, and burns with complete combustion. The mixture passes from the cones into the upper part of the burner, where there is a wire gauze surrounded by a metal shell or cone. On igniting the gas, the flame heats this inside gauze; and the mixture of gas and air, being compelled to travel through it, also gets heated. The mixture then issues between the wire gauze and the outer cone to the orifices of the burner. The ordinary wire gauze cap has been replaced by a metal disc, in which teeth are cut nearly to the centre. The bye-pass tube is now outside the burner. The Company will not be prepared to supply the burners to the public before the beginning of June, owing to the erection of the machinery required for their output in large numbers not being completed. Those so far produced have been made by hand; and examination of the naked flames of the various sizes leaves little room for doubt that the mixture of air and gas is most complete, and that the heating value of

the flame is very great. The contrast between the flames of the old and new burners is most striking. In the case of the former, there are irregular variations of colour and a ruggedness of form. In the flame of the new burner, there are not such marked variations in colour. It is almost blue throughout, with just a slight fringe of brighter blue round the periphery of the burner top; while in shape it is perfectly conical, and its steadiness is remarkable. While speaking of the burner top, another improvement may be mentioned. With the old style of burner, consumers frequently lose a certain amount of illuminating power by dirt settling on the gauze and nipple. There is every reason to believe that this will not be the case with the new burner, because the teeth of the metal disc already mentioned are so wide and so regulated that no dirt can remain on the top when the burner is in use.

As will already have been gathered, very much is claimed for this new burner; but one of the most astonishing features (writing from the information supplied) is the effect upon the illuminating power of upward changes in the pressure of the gas. Uniformity of pressure has a great deal to do with the maintenance of a constant efficiency in the case of the old burner. Suppose, for example, a "C" burner, consuming about 3½ cubic feet of gas, is regulated for a certain pressure—say, 1, 1½, or 2 inches, according to its situation—if the pressure is increased above that which the burner is regulated to deal with, imperfect combustion is at once set up, resulting in a distressing diminution of the illuminating power, and oft-times in the permanent injury of the mantle. With the new burner, the results are surprisingly different. Exhaustive experiments demonstrate that, *if the burner is regulated to the minimum pressure obtainable*, whatever may be the increase of pressure, the only result upon the flame is that it becomes hotter and hotter, and the light more brilliant in consequence. Mr. Moeller is prepared to demonstrate that if the pressure is increased, by artificial means, to 10 inches, a light equal to that of an electric arc lamp is obtained with more steadiness and a better colour. There are plenty of towns in England where a pressure of 1½, 2, and even 3 inches is obtained; so that it will be a boon to every gas consumer to have a burner that will, with every increase in pressure, give more light in proportion to the increase of gas consumed. The best results from the new burner for ordinary lighting are obtained with a pressure of from 1·8 inches to 2 inches. At this rate, about 35 candles per cubic foot of gas consumed is obtained; while at the ordinary pressure, as already stated, an average of from 25 to 30 candles is yielded. Of course, if there is a drop from the minimum pressure, there is a falling off in efficiency.

The next important advantage of the new burner is that these results are attained without the use of a chimney; and the removal of this source of nuisance will have a great effect in the popularization of the burner. Objection may be raised to the dismissal of the chimney by those who regard it as a protector to the mantle; but the Company will meet such objectors with experience which shows that, when the mantle is settled over the very hot flame of the new burner, it keeps its form perfectly, that it will now be free from the mechanical destruction which occurred through the sharp current of air caused by the chimney impinging on it, and that the dusty atmosphere of their factory has not detrimentally affected mantles on burners fixed there for experiment—in fact, they are perfectly satisfied that the life of the mantles will be as long as, if not longer than, with the old burner and chimney, and that the loss of mantles by the fracture of glasses will be entirely obviated. The removal of the chimney has also given the workers of the Company a new field for the display of their ingenuity in the art of decoration in the case of the burners designed for domestic use; and their efforts in this direction deserve the highest commendation. Most of the small globes which are to be supplied with the new burners are really objects of beauty. They have been designed in various styles, and are either delicately tinted or plain to suit the varied tastes of customers or the apartment in which they are intended to be used. The smaller lights when fixed on a chandelier or disposed at intervals round a room make a very effective display.

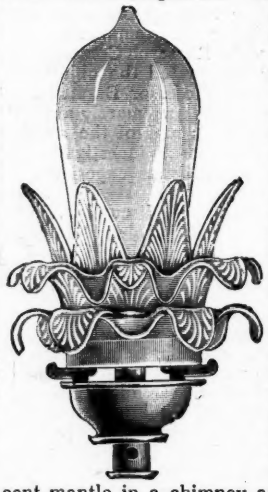
The success of the Welsbach system as a street lighting agent with the old burner has been fully established; but the superior advantages of the new burner should cause it to be almost universally adopted. The Company argue, and we agree, that lighting authorities cannot afford to disregard a burner, which, with a consumption of 2·2 cubic feet gives a light of 55 to 60 candle power, as against the 12½-candle power of an ordinary 5-foot burner. The economy is too considerable to be ignored; but if a greatly increased light is preferred to a saving of gas, the Company can supply a burner consuming 5 cubic feet, and affording a light of from 125 to 150 candle power. In connection with street incandescent lighting, there are two points of paramount importance which cannot be too strongly insisted on. The first is the necessity of having trained men to fix and attend to the burners, and the second is the use of thoroughly sound and rain-proof lanterns. The Company have constructed a number of lanterns for use with the new burner; and from the variety of styles they have produced, lighting authorities will not fail to find something which will meet their views in the matters of decoration or neatness as the case may be. The discarding of the chimney has given considerably more play to the production of lanterns which are more pleasing to the eye, as the tops can be arranged with greater facility than formerly.

We think we have now said enough to show that the new invention marks a highly important epoch in the history of gas as an illuminant; and there is no doubt that it will exercise in the future a powerful influence in the competition between gas and electricity.

During the present week, an attractive display of the new burner is being made at Niagara (close to the Welsbach Company's offices). We understand that members of the gas profession may obtain admission by presenting their cards; and they will certainly do well to avail themselves of this opportunity of seeing, under particularly favourable circumstances at any time, this latest development in gas lighting. Messrs. Julius Moeller and Fonblanque, with Mr. Sheldrake and other members of the staff, are in constant attendance, and are particularly painstaking in affording information and in giving facilities for investigating the burner. Numerous examples of the various sizes of burners are shown fixed on nearly every conceivable style of fitting, both for domestic and street lighting. A striking comparison of old ordinary and the new incandescent burners is made in two adjoining apartments. In one is a chandelier on which are three ordinary burners consuming 5 cubic feet of gas each, and in the other are fixed ten of the 1-foot new burners and two consuming 2·2 feet each; so that the consumption of gas in the two apartments is about equal. Standing a short distance from the entrances, the first presents quite a gloomy appearance, while the other looks as if it is flooded with sunshine. Another noteworthy feature of the exhibition is a display of large incandescent burners, which are supplied with gas, by means of a system to which the inventor has given the name "Hydro-Press Gas"—in other words, the ordinary supply of gas is raised by his apparatus to a pressure of 10 inches. These lights (the illuminating power of which has not yet been photometrically tested) are shown in a separate apartment, as they are perfectly dazzling. On Saturday, the Company were honoured by a visit to the exhibition by H.R.H. the Prince of Wales, who evinced great interest in the burner, and expressed himself as very favourably impressed by the results obtained. Yesterday was set apart for a visit, by invitation, of a number of gentlemen connected with the gas industry. They were addressed at some length by Mr. Moeller, who, in the course of his remarks, stated that the burner was the invention of a M. Kern, of Paris. At the close of the inspection, the visitors were entertained to luncheon at the Hotel Windsor. In responding to a toast on behalf of the gas engineering profession, Mr. W. A. Padfield, of Exeter, suggested that the Company would confer a great benefit on the gas industry by making arrangements for a similar exhibition in the principal centres in the Provinces.

THE "JENA" INCANDESCENT GAS BULB.

Of the many novelties that have been brought out in connection with incandescent gas lighting, one of the most effective—especially from a decorative point of view—is the new "Jena" incandescent gas bulb, of which Messrs. Falk, Stadelmann, and Co., Limited, of Farringdon Road, E.C., are the sole licensees in this country. The accompanying illustration gives a pretty clear idea of the arrangement. The bulb (which may be had entirely



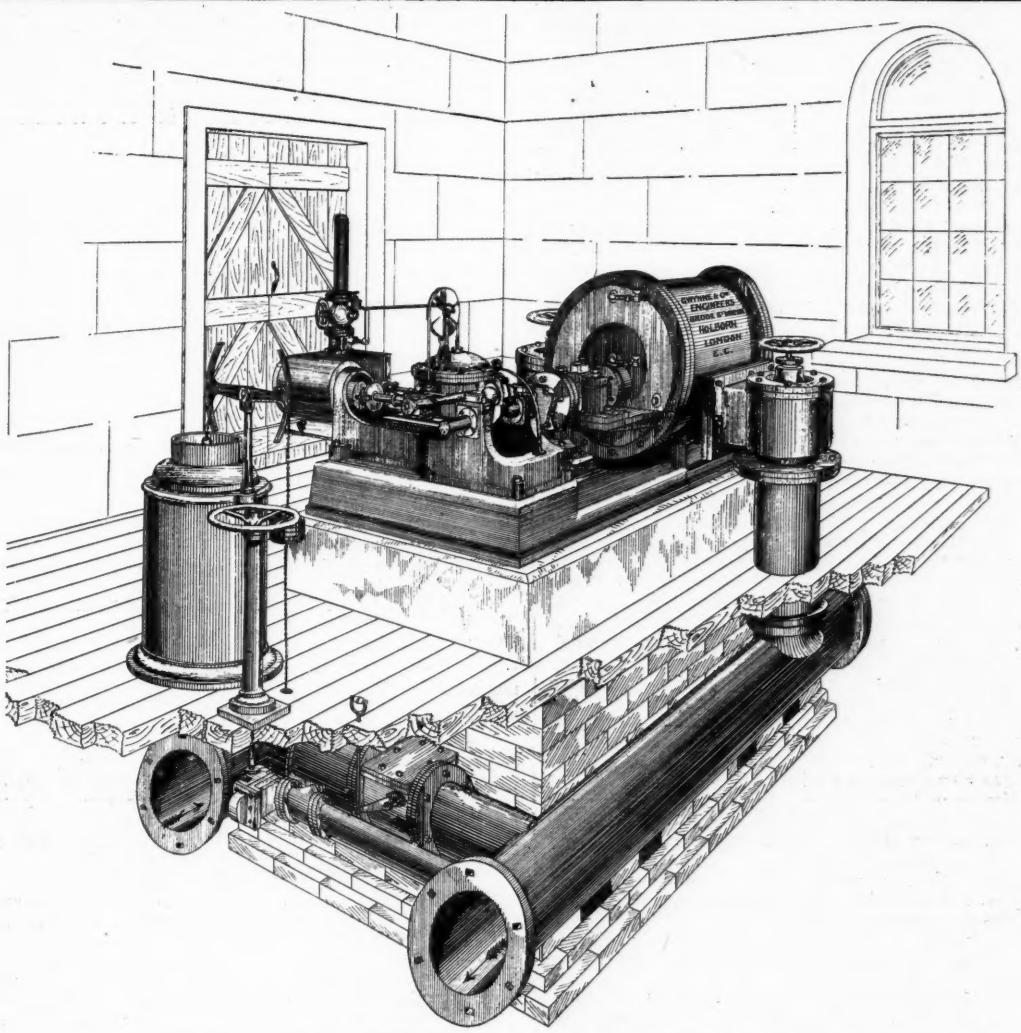
frosted or the bottom half clear) fits the burner in lieu of the ordinary chimney; and, although not shown in the engraving, it is, of course, formed with openings in the top—three in number and circular in shape. The glass screen, which rests on the globe gallery in place of a shade, is made in a variety of artistic designs and colours. At the base of the screen, a special plate is provided which answers a threefold purpose. Its main object is to prevent the burner lighting-back; but at the same time it protects the mantle from damage by sudden draughts of air, and conceals the somewhat unsightly portions of the burner. Enveloped by this combination, the light bears a striking resemblance to the electric light; and certainly there is not the loss of illuminating power that results from encasing an incandescent mantle in a chimney and globe. There is no doubt, too, that the arrangement will assist in preserving the mantle by excluding dust, &c., and will also to some extent prevent the objectionable discoloration of ceilings that occurs when gas is burned with unshielded open-topped chimneys. We have not had an opportunity of testing the durability of these bulbs under the intense heat to which they are subjected, but are assured that they withstand it in a remarkable manner. At any rate, in its heat-resisting quality, as is well known, Jena glass defies competition. The illustration represents one of several patterns which the manufacturers have produced; and others are in course of preparation.

GWYNNE'S NEW GAS-EXHAUSTING MACHINERY.

One of the most important considerations in all manufactures of to-day, including that of gas for illuminating purposes, is economy. This is naturally due to—indeed, it is the direct result of—the keen competition which prevails on all hands. Never was the necessity for the exercise of economy, especially among gas manufacturers, more deeply felt than it is at the present day. Fully alive to this necessity, Messrs. Gwynne and Co., of Brooke Street Works, Holborn, have introduced a new arrangement of gas-exhausting machinery which they claim is not only economical in first cost, but is reliable and durable in working. The accompanying illustration shows one of these combinations, designed to suit the requirements of a large number of gas-works where the make may be classed as small or medium, in comparison with that of the works in large cities. As will be seen, the arrangement is exceedingly compact—a recommendation of the greatest importance in many works where the make has outgrown the expectation of the builders, and where every available square foot of space is of value.

In the design and construction of this plant, Messrs. Gwynne and Co. have been true to the principle they adopted many years ago in their business—viz., that "in all things, but proverbially in mechanism, the supreme excellence is simplicity;" for it would be difficult to conceive a less complex combination of working parts, each of itself being of the most simple character, and designed to perform its duties in the easiest and most efficient manner. The greatest attention has been paid to the keeping down of costs without in any way interfering with the workmanship and durability of the appliance.

It may be mentioned that it was at the express desire of some of their customers that Messrs. Gwynne and Co. introduced this arrangement to meet the views of those gas engineers and managers who are not so particular as to the faultless finish and brilliant appearance of their engine-room as they are anxious to be in a position to turn out the greatest amount of work at the least possible expenditure of capital. It may be added, however, that they still continue to manufacture their highly-finished machinery as of old; and, as a proof that the demand still exists for high-class work, it may be mentioned that at the present time the firm have on hand more than twenty sets of exhausting plant for gas-works, and some extra strong plants for working under the high pressures required for the bye-products process. Among the former are two sets of as large a capacity as any that have yet been fitted in gas-works; each being capable of passing 300,000 cubic feet of gas per hour at a slow speed.



Consolidated Water-Works Company of Rosario, Limited.—The report of this Company for the year 1897 states that the gross revenue amounted to £28,465, and the expenses to £13,895; leaving a balance of £14,570. After providing for debenture stock and other interest and income-tax, there remains an available balance of £7270. An interim dividend of 2 per cent. was paid on the preference shares in November; and the Directors now recommend a further dividend on these shares of 3 per cent. (making 5 per cent. for the year), carrying the balance of £315 to the reduction of preliminary expenses account. The steady progress that has characterized the business of the Company in recent years was somewhat checked in the year under review. This is attributable to extreme depression in trade in Rosario, consequent on the partial failure of the crops for several years in succession. The outlook at present is decidedly more cheerful than it was a year ago; and the Directors anticipate that the development of the Company's business will resume its normal course.

Deacon Waste-Water Meters at Ince.—At the last meeting of the Ince District Council, the Chairman (Mr. T. M. Percy), in moving the confirmation of the Water Committee's minutes, said it would be within the recollection of the members that he stated twelve months ago that something should be done with a view of reducing the enormous consumption of water. Shortly afterwards the Council decided to adopt Deacon's waste-water meters; and he (Mr. Percy) then took the opportunity of stating that he had every reason to believe they would bring down the consumption very considerably. It was interesting now, at the end of the year, to compare the consumption for the years 1896-7, with that for 1897-8. The consumption of water from Golborne for 1896-7 was 103,406,000 gallons; while for 1897-8 it was 79,051,000 gallons, or a reduction of 24,355,000 gallons. The consumption from Rivington was 60,966,000 gallons in 1896-7, as against 36,727,000 gallons in 1897-8, or a reduction of 24,239,000 gallons. The total reduction, taking Golborne and Rivington together, equalled 48,594,000 gallons. The Council had paid to the Liverpool Corporation for water in 1896-7 £1495 18s.; and in 1897-8 they would pay £1034 7s., or a reduction of £461 11s. To enable them to find out the leakages, the Council had paid to the Palatine Engineering Company, £916 16s. 3d.; and, from the figures he had given, with the expenditure they had been able to save in hard cash £590 3s. He thought the Council would agree with him, therefore, that it was a very wise step to purchase the Deacon meters; and while they might constantly expect subsidences in a mining district such as theirs, if their officials would make full use of the appliances the Council had now given them, there was no reason why the leakages should not be reduced to a minimum. He believed he was correct in stating that Ince was never better off for water than it was at the present time.

REGISTER OF PATENTS.

Removing Scurf from Gas-Retorts.—Billington, C., jun., of Stoke-on-Trent. No. 7686; March 25, 1897.

This invention relates to a method of forcing a current of air by means of a jet of steam into the lower end of a gas-scrubber, into a condenser, or into a series of gas-scrubbers, or a series of condensers successively; cooling the mixture of air and steam by sprays of cold water injected into the scrubbers or condensers from their upper end; and forcing the air

Fig. 2.

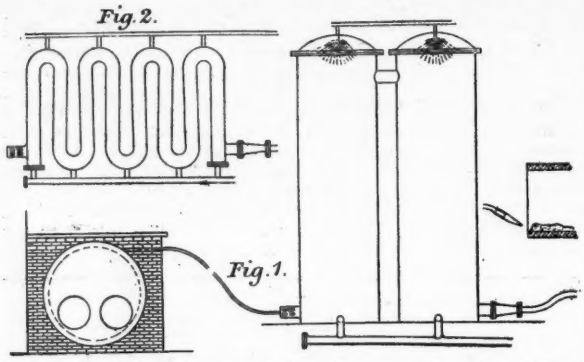


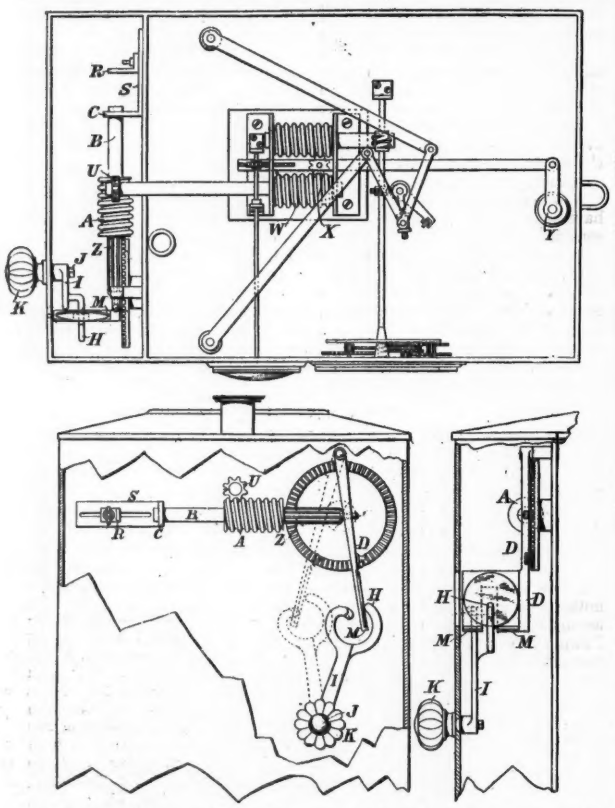
Fig. 1.

(deprived of its steam from the last scrubber or condenser) against the carbon adhering to the interior surface of the retorts after the charge has been withdrawn, in order to loosen the carbon—all as shown in fig. 1.

As an alternative, a series of straight, curved, vertical, horizontal, or inclined metallic pipes connected by bends, may be used to cool the mixture of air and steam—as shown in fig. 2.

Price-Changing Mechanism for Coin-Freed Gas-Meters.—Glover, R. T. & J. G., of Clerkenwell, E.C. No. 11,229; May 5, 1897.

This price-changer consists of a worm A on a rod B, which is free to slide end-on in a bearing C under the action of a lever D pivoted so as to have a swing or pendulous motion—say, to the distance indicated by the dotted lines, when moved by the lip H of the appliance I acting on the coin in the coin-rest M, fitted outside the casing and connected by the pivot J. The lower part of the lever is formed of two prongs, leaving a gap between them, but connected at the bottom by the coin-rest M for receiving a coin passed through a slot in the front of the casing. The lever is at a sufficient angle for its rest to receive the coin when moved the necessary distance for the purpose; and there is a shutter (not shown) connected to the stem I to close the slot, except when it coincides with the



slot in the casing. The lip of the stem I is double faced; one lip acting as a discharger of the coin from the cradle or rest at the commencement of the return motion of the lever, the other coming to bear against the back of one of the prongs to force the lever back when the handle K is reversed, and so cause the shutter-slot to uncover the slot in the casing for the insertion of a fresh coin.

The forward throw of the lever D slides the rod B along in the bearing C, until it bears against the stop R; this being adjustable in the groove of the plate S, and affixable by a nut according to the quantity of gas to be consumed for the value of each inserted coin. Variations are effected by uncovering a sealed plate from the front of the casing as desired.

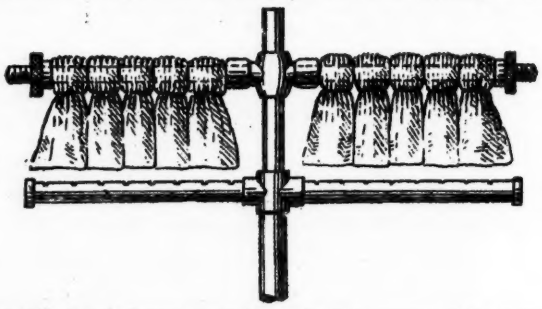
During the forward sliding action of the rod B, the worm A causes the pinion U to rotate; and this being on the shaft of the worm W ensures the rotation of the pinion X to effect the opening movement of the gas inlet-valve Y, as described in patent No. 22,830 of 1894.

The worm-rod B has its fore end toothed as a long pinion Z; and during the forward travel of the lever D, the teeth slide in the teeth of an idle wheel without imparting rotation to it by reason of the pawl on the lever D riding over the teeth. But during the reverse travel of the lever, the pawl engages the teeth of the idle wheel, and forces it round on its axle. Consequently the long pinion Z is rotated, and with it the worm A; the pinion U remaining stationary, and not affecting the other appliances within the meter-casing.

There are thus two different characters of movement effected by the coin mechanism—that is to say, on the forward movement after the insertion of a coin, the worm A and long pinion Z are slid along, and the worm acting as a rack rotates the meter-mechanism pinion U a given distance to open the valve Y, and the return movement of the coin mechanism (such as for the insertion of a fresh coin) rotates the idle wheel and operates the screw A and long pinion Z, to return it to the starting position without affecting the meter mechanism.

Incandescent Gas-Lights.—Léry, J. B. de, of New York. No. 2365; Jan. 29, 1898.

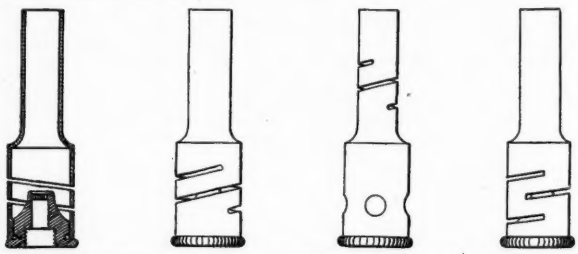
This is a modification of patent No. 9940 of 1897, wherein "tufts or bunches of the incandescent material" were described as supported on a ring, and bunched and secured together along one edge, while at the other edge the layers are separated so as to admit the heat of the flame and furnish as large a surface as possible for incandescence. In the use of this device, the patentee has discovered that it is necessary to form



these tufts of incandescent material in a definite manner, with a view to opening the lower edges and forming them into a series of open-ended cones or caps similar in shape to the well-known mantle for single burners; and the chief object of the present invention is to fold the incandescent material in such a manner as to produce open, or partially open, ended cones into which the gas-flame may rise. The illustration shows a series of such tufts arranged in place above the gas-outlets of the burner.

Bunsen Burners for Incandescent Lighting.—Himmel, G., of Wurtemberg, Germany. No. 2615; Feb. 1, 1898.

This device has for its object to prevent the destruction of incandescent mantles when the lamp is shaken, by forming slots of suitable form (but preferably spiral) in the bunsen burner air-tube or the upper part of the air-tube carrying the mantle, cylinder, and the like to produce a spring action in all directions.



The most suitable slot to give a spring action to all sides to the upper part of the burner-tube is a spiral slot running round the lower part of the tube, the pitch of which may be made larger or smaller according to the weight of the lamp. The spring action is said to counteract "all joltings of the lamp so that they have no action on the mantle." The slot also replaces the ordinary air-supply holes; producing a rotary action of the air and a more thorough and rapid mixture of the air with the gas in the burner-tube. The slot may, however, be formed in the upper part of the burner-tube itself; and in this case the upper part of the lamp must be mounted on the burner-tube. This arrangement is, however, less preferable. A further kind of slot may be made in the burner-tube by cutting therein, alternately from right and left, oblique or straight slots one above the other.

Gas or Petroleum Engines.—Bapst, G., and Grelet, A., of Paris. No. 2755; Feb. 3, 1898.

This engine consists of a horizontal cylinder divided into two equal parts rendered independent of each other by a central partition. Each cylinder receives a piston actuating a central shaft by means of a lever and connecting-rod. The valve-gear consists of one admission and one exhaust valve for each cylinder—all enclosed and actuated by a cam driven by the motor shaft. The carburation of the air is effected by a valve placed in front of the admission-opening, and automatically opened by the piston during the exhaust period. Ignition takes place simul-

taneously in the two cylinders; and the effect of the explosions on the right and left hand pistons is equalized by the central partition. The pistons move at the same time away from one another, and act on the same shaft provided with two opposite cranks, so as to likewise equalize the effects on this shaft.

Enriching Gas of Low Illuminating Power.—Imray, O.; a communication from E. Pilous and A. Michaelis, of Vienna. No. 23,237; Oct. 9, 1897.

This is a process for enriching or carburetting gases of low illuminating power, "consisting in passing the gases produced from house, market, or street refuse or sweepings, sewage matter, petroleum, oil or wood waste, coal and other organic residuous and waste products suitable for gasefaction, either before or after purification, into a carburating vessel containing calcium carbide, either alone or mixed with hygroscopic salts—such as alkaline carbonates—where the gases are enriched by taking up the gas generated very slowly and uniformly from the calcium carbide."

In their specification (which is not illustrated) the patentees say: The proportions of the mixture of calcium carbide with the sodium carbonate are not definitely fixed; but it is of advantage to take 3 parts of calcium carbide to 5 parts of sodium carbonate or other hygroscopic salt. The carburator is provided with hurdles, on which the calcium carbide or the mixture is spread, so as to afford as large a surface as possible for the gas to come in contact with. The gases to be carburated are produced by heating the before-mentioned substances in retorts, either separately or mixed; or the gases may be distilled from each material separately, and be then mixed together before passing through the carburator.

They pass from the retorts through a hydraulic main into a condenser, and thence into the carburator, or first through the carburator and then through the condenser. The lime set free by the decomposition of the carbide "constitutes a purifying medium for the gaseous mixture formed in the carburator."

APPLICATIONS FOR LETTERS PATENT.

9023.—Dargue, W. H., "Generation of acetylene gas." April 19.
9037.—Walton, J., "Gas and oil engines." April 19.
9054.—Richards, H. E., and Chapman, C., "Glass chimney for use with lamp and gas burners." April 19.
9075.—Bueb, J., "Extraction of cyanogen from coal gas." April 19.
9084.—Himmel, G., "Incandescent gaslight burners." April 19.
9104.—Thorn, F. S., and Hoddle, C., "Purifying acetylene." April 20.
9194.—M'Innes, C. F., "Improved method of lighting rooms and buildings by means of reflected light." April 21.
9199.—Thorp, T., "Acetylene gas generator." April 21.
9219.—Colbran, J. B., "Gas-lamps." April 21.
9226.—Lauri, C. L., "Self-cleaning burner for acetylene gas." April 21.
9240.—Chandler, S., jun., & J., "Manufacture of gas from oil or other fluids." April 21.
9251.—Sugg, W. T., "Burners for burning gases rich in carbon." April 21.
9269.—Thompson, W. P., "Producing acetylene gas." A communication from J. Grand. April 21.
9306.—Wright, J. E., "Hot-plates of gas cooking-stoves." April 22.
9313.—Smith, W. B., "Atmospheric burners." April 22.
9319.—Javal, A., "Production of acetylene gas." April 22.
9346.—Keim, J., "Water-meters." April 22.
9348.—Keim, J., "Water-meters." April 22.
9384.—Kitchen, J. G. A., "Producing acetylene." April 23.
9395.—Aubertin, N. A., "Acetylene gas-lamps." April 23.
9416.—Timar, D., "Oil and gas motors." April 23.
9438.—Glover, R. T. & J. G., "Gas blast appliances for general heating and incandescent lighting purposes." April 23.

A Water Scheme for Littlehampton.—The Littlehampton District Council have for some time past been considering the question of providing the town with an additional water supply. Several schemes have been suggested; but only two have been found practicable. One of these is an offer by the Duke of Norfolk to supply up to 125,000 gallons per day, at a charge of 2d. per 1000 gallons, from his tanks in Arundel Park; and the other consists of the sinking of a well and the erection of engines at Warning Camp, and the construction of a reservoir, capable of holding 300,000 gallons, on the top of Arundel Hill. The first scheme would involve an outlay of £9398, and the second of £10,717. The annual working expenses of the first would be £795, and of the second £886. The Council have decided upon the Warning Camp scheme, as it is believed that it will furnish the town with an unrestricted supply.

Antwerp Water-Works Company, Limited.—The annual meeting of this Company was held last Friday, at the London Offices, 96-98, Leadenhall Street, E.C.; Mr. David Evans presiding. The report stated that the income for the year from all sources amounted to £36,059, as compared with £35,334 for 1896; and after deducting the working expenses, the cost of laying services, and London expenses, there was a balance of £22,551. Adding the undivided profit brought forward (£444), made a total credit of £22,995, against which had been charged the debenture interest and the income-tax for the year, the contribution to the reserve fund of 5 per cent. on net profits as provided by the articles, and the interim dividend of £6000. There then remained for distribution the sum of £14,060, out of which the Directors recommended a balance dividend at the rate of 5 per cent. per annum (making 4½ per cent. for the year), and the transference of £4700 to the sinking fund—leaving £1860 to be carried forward. In moving the adoption of the report and the above recommendations, the Chairman stated that the business continued to increase at about the normal rate. For the first time, the Directors were proposing to pay a dividend at the rate of 5 per cent.; and they hoped to be able to maintain this in future. They were carrying forward a large balance, so as to secure the same dividend next year, unless something extraordinary happened, of which there was no indication at present. Mr. William Blaber seconded the motion, which was unanimously carried. The retiring Directors (Messrs. Evans and Blaber) were re-elected.

CORRESPONDENCE.

[*We are not responsible for the opinions expressed by correspondents.*]

Mr. George Livesey and the Management of The Gaslight and Coke Company.

Sir,—I intended to reply to the letter of Colonel Makins in this week's "Journal" in your next issue, but found, after beginning the letter, that there are some other points in his "Reply" which need answering. I must therefore defer the matter for a week, because I wish to say all that is necessary, and then, if possible, to avoid any further public discussion of the subject.

April 29, 1898. George Livesey.

The Dundee Gas Commission and Enrichment.—A Correction.

Sir,—Among "Miscellaneous News" of your issue of the 19th of this month, under the heading of "The Supply of Water Gas in Liverpool," it is stated that Mr. Foulis's scheme for the enrichment of gas is about to be adopted in Dundee "for economical reasons." Allow me to point out that this is not correct, as my Board have not yet resolved to adopt any particular scheme for the enrichment of the gas supplied to the city.

Dundee, April 27, 1898. W. M'Crae.

[We may point out that the statement referred to by our correspondent was not ours, but Lieut.-Colonel Cayzer's.—Ed. J.G.L.]

The Generation of Electricity at Gas-Works.

Sir,—According to the last Parliamentary Returns relating to Gas Undertakings, there are in the United Kingdom: 433 private gas companies and 208 municipalized gas undertakings, the majority of which are at the present time making a considerable profit from gas and bye-products. During the year 1897, an application for provisional protection for a process for the "generation of electricity at gas-works by utilizing the waste gases and heat" was passed by the Patent Office; and the applicant is of opinion that it is possible to generate from 30 to 50 Board of Trade units of electricity, as well as 9000 to 10,000 cubic feet of gas from a ton of coal as well as the usual bye-products, coke, &c. If this is possible, what will be the ultimate cost of electricity?

The capital expenditure of the gas undertakings is stated to be about £66,500,000; and the expenditure on electrical central stations is increasing so fast that the figures can hardly be correctly stated. But it is certain that if it were possible or practicable to make gas and electricity at the same works a large amount expended on land and buildings would be saved; besides which there would be considerable saving in the departments of distribution and collecting.

Another feature is the question of Dowson or power gas made from cheaper coal having less illuminating, but greater calorific power; and the combination of some of the systems would obviate the necessity of storing the electricity, which forms the most costly part of an electrical undertaking when "works cost" is calculated.

The great increase of electrical traction, the comparatively low cost and advantage of electrical motive power and its distribution, and the question of "day load," may be solved by utilizing gas-works for the production of electric light and power as well as illuminating and power gas.

All this hinges upon two questions: Is it possible or practicable to utilize the present waste gases or heat at gas-works for the generation of electricity? Also; Are the gas companies, which for many years have supplied us with light, heat, and power, to be superseded?

Now, as many Municipalities are owners of the gas undertakings, and have applications for electric light, would it not be worth their while to consider these questions? Gas engineers have been studying how to improve their light, and electrical engineers how to cheapen theirs; and both have overlooked the fact that it is possible to produce gas and electricity at the same time from the same coal. What the public want is cheap and good light, heat, power, and quick transit, and the profits thereof to go to the reduction of the rates; and it may be found practicable by combining the production of gas and electricity at one and the same time at gas-works.

Bristol, April 28, 1898. S. T. White.

The Profits of the Blackpool Gas Department.—The result of the trading of the Blackpool Gas Department last year was a gross profit of £17,000; and after sinking fund and reserve had been provided for, the balance to be handed over to the relief of the rates was £10,400—an increase of £2000 over last year. The output of gas was 342 million cubic feet—an increase of 28 million feet over that of last year.

The Gloucester Corporation and the Gas Company's Bill.—At a meeting of the Gloucester City Council last Tuesday, it was reported that the Town Clerk (Mr. G. S. Blakeway) had laid before the Finance Committee a print of the Gloucester Gas Bill as amended, and stated that, having regard to representations made on behalf of the Corporation, the Company proposed by clause 6*a* to transfer to the credit of the capital account of the Company £10,000—being part of the £13,720 standing to the credit of the profit and loss account—such sum not to be considered as capital entitled to dividend or as available for distribution as profits. The Town Clerk stated that he had seen the Company's Solicitors, and urged that, having regard to the amount of the accumulated profits, the price of gas should be further reduced. But it was pointed out that the price was lowered 2d. per 1000 cubic feet in August last, and that the value of coke and other residual products had since depreciated. While the Company were willing to keep the price of gas as low as possible, they did not like to promise any further reduction at present; but if the Corporation accepted the proposed clause, and allowed the Bill to pass without opposition, the Company might undertake to make a reduction of 1d. per 1000 cubic feet after the expiration of the current half year. The Committee resolved that, subject to the Company giving the suggested undertaking, the Council should be recommended to accept the proposal contained in the clause mentioned, and the other alterations shown in the amended Bill; and the resolution was confirmed.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress has been made with Bills:—

Bills brought from the Commons, read the first time, and referred to the Examiners: Crawley and District Water Bill, Enfield Gas Bill, St. Anne's-on-the-Sea Gas Bill.

Bill presented, read the first time, and referred to the Examiners: Gas Orders Confirmation Bill (No. 1), relating to Budleigh Salterton Gas, Coatbridge Gas, Great Marlow Gas, King's Lynn Gas, and Whitchurch (Salop) Gas.

Bills read a second time and committed: Hartlepool Gas and Water Bill, Northam Urban District Water Bill, North Warwickshire Water Bill, Norwich City Water Bill, Southend-on-Sea Gas Bill, Thanet Gas Bill, Tottenham and Edmonton Gas Bill, Whitwick and Coalville Gas Bill.

HOUSE OF COMMONS.

The following further progress has been made with Bills:—

Bill presented, read the first time, and referred to the Examiners: Gainsborough Gas Bill.

Bills read a second time and committed: Liskeard Corporation Water Bill, Sheringham Gas and Water Bill.

Bills reported: Edinburgh and Leith Corporations Gas Bill, Folkestone Gas Bill, Staines Reservoirs Joint Committee Bill, Swansea Gas Bill, Waterford City Gas Bill, Wishaw Water Bill.

Bill read the third time and passed: Enfield Gas Bill.

The Standing Orders Committee have reported that in the case of the petition for the Gainsborough Gas Bill, the Standing Orders ought to be dispensed with.

HOUSE COMMONS COMMITTEE.

(*Before Mr.* JOHNSON-FERGUSON, *Chairman, the Hon.* T. W. LEGH, *Mr.* CROMBIE, *and Mr.* WENTWORTH.)

Among the Bills in Group F referred to this Committee, whose sittings commenced on the 21st ult., were the Staines Reservoirs Joint Committee Bill, the Southwark and Vauxhall Water Bill, and The Gaslight and Coke Company's Bill.

STAINES RESERVOIRS JOINT COMMITTEE BILL.

This Bill came before the Committee on Monday last week. According to the opening statement of Counsel (Mr. Pope, Q.C.), it appeared that the main proposal of the Bill was the enlargement of the new storage reservoir No. 1A. In order to effect this, it was proposed to take over a sewage farm belonging to the Staines Urban District Council. This sewage farm adjoined the reservoir; and though the promoters had held, and held successfully, before the Committee in 1896, that the sewage farm would be in no way detrimental to the reservoir, it was recognized that it would be advantageous from the point of view of sentiment that it should be removed. The Staines Urban District Council were not satisfied with the sewage farm; and the promoters sought to enlarge their reservoirs by its absorption. It was proposed, so far as the interests of the Staines Urban District Council were concerned, to substitute for the sewage farm land other lands included in the provisions of the Bill, and transfer them to the Staines Urban District Council. It was also proposed to take compulsorily more land than was required for the sewage farm—land situated in two places—so that the Staines Urban District Council might be able to make choice of one of two sites; one being near the reservoir, and the other some distance away. There was a subsidiary object in view—namely, the clearing up as to the effect of certain provisions in the Act of 1896, in reference to the closing of a footpath. To carry out the objects of the Bill, it was proposed to raise £250,000 of Staines Reservoirs guaranteed debenture stock, in addition to the £1,000,000 of such stock already authorized. In reply to the Chairman, it was stated that there was no objection to the clause dealing with the raising of debenture stock; and that the whole of the interest on the stock was guaranteed jointly and severally by the three Water Companies who formed the Joint Committee. It was pointed out that there were several petitioners. In the first place, the Middlesex County Council petitioned against the Bill. They said they had opposed the measure of 1896; that clauses were inserted for their protection; that under the present Bill there would be unnecessary interference with roads and bridges under their control; and that no clause was proposed for their protection. The learned Counsel said there would seem to be some mistake here, as the promoters did not propose any interference with roads and bridges which would prejudice the Commissioners. Of course, the promoters ought not to interfere with their roads and bridges in any other way than that authorized under the Act of 1896. It was said that the promoters sought to evade the carrying out of the provisions of the Act of 1896; and that the new Bill would enable them to carry out works without obtaining the consent of the petitioners. If this related to such minor points as the width of roads, it could be settled by the insertion of a clause. He had no doubt the promoters would be able to meet the Middlesex County Council; but if they could not satisfy them, they would be willing to leave the matter in dispute to be decided by any competent authority. The clause dealing with the footpath crossing the site of the reservoir, was objected to on the ground that it would enable the promoters to close up the existing footpath before that which they were to make in substitution for it was completed. It would, however, in the nature of things, not be possible to avoid having an interval of time between the stopping up of the old footpath and the opening of the new one; but the promoters took on themselves an obligation to make a new footpath. Parliament would be careful to secure that the proposed new footpath should be completed; and he was sure they would not lay down fresh conditions which would prevent it being constructed at all. The County Council also said that the promoters wished to evade their obligations as to a county bridge over the River Ash; but in these matters he should ask the Committee to hear the Engineers, as he was not familiar with the details. The City of London had petitioned, but did not appear by Counsel. The Thames Conservancy Board also petitioned; but he was at a loss to know what they wanted. Mr. Fitzgerald, Q.C. (who appeared for the petitioners in question), remarked that their objection was that the provisions contained in the Act of 1896 were not inserted in the present measure. Mr. Pope (continuing) said that there was a report from the Local Government Board on the subject of the restriction against the Joint Committee selling their water to other companies; the Government Department thinking it desirable that the restriction should be removed. In good faith to the other Companies, however, he did not feel himself at liberty to back up this report. When they had in their hands the report of the Royal Commission which was now sitting they would no doubt be able to discuss the matter, because at certain times—for instance, on the occasion of drought in the East of London—it would be of public advantage if Companies who had plenty of water were able to give supplies to those who were running short. But it would be wrong for him to do anything affecting other Companies which those other Companies were not present to assent to. The Parish Council of Stanwell petitioned on the subject of footpaths; and the Board of Management of the West London School District petitioned on the ground that one of the sites which it was proposed to take for the purposes of the sewage farm would be detrimental to their school, which contained over 700 inmates.

Mr. Walter Hunter, M.Inst.C.E., Engineer to the Joint Committee, was called for the promoters. He stated that the Committee had curtailed the size of the reservoirs in 1896, in order to save the sewage farm. But this farm was now the subject of complaint in the district. It was not working satisfactorily; and the Staines Urban District Council were not averse to parting with it. In his view, it would be an advantage, rather than the reverse, that the site of the sewage farm should be taken for reservoir purposes. When they had found that there was no longer an obstacle to the acquisition of the land, it had seemed to him that it would be very advantageous to extend the reservoir, much in the way that had been originally proposed. The authorized reservoirs were constructed to hold 2500 million gallons of water; but the storage quantity under the present proposal would be increased by 1800 million gallons. The promoters, however, asked for no more powers to take water from the Thames. They would get a few more days' storage; but the water would be taken under the powers and limitations contained in the existing Act. The proposal now made would be better for the reservoir in time of flood; and it would be obviously better for the consumers. The estimated cost of the increased storage would be £93,000. The promoters would get one-third more storage of water for an increase in cost of only 12 per cent. It would be not only an advantage in other respects, but the proposal in the Bill would tend to cheapen the average cost per million gallons for the storage of water. The additional capacity they would get in the reservoir would cost £116 per million gallons of storage. The present was the most convenient time for carrying out the work. The cost of the reservoir as originally designed was £180 per million gallons; and therefore the present proposal would bring down the average cost. The two sites which it was proposed should be taken in order to enable the Staines Rural District Council to move their sewage farm, had been chosen at the suggestion of the Engineer of the District Council. The Joint Committee had been obliged to purchase a larger amount of land than was originally intended, for several reasons. As to the sewage farm, any mismanagement there might have been could easily be obviated when a new site was procured. In regard to the footpaths, it would be inconvenient to continue the one across the reservoirs in a diagonal line; and the promoters proposed a footpath which should run across the bank dividing the two reservoirs. The provisions in the Act of 1896 regarding the footpaths would be made plain in the present Bill. As to cost, £93,109 would be taken for works and land; £10,000 for Engineer's expenses; and £50,000 for working capital. He did not think that £250,000 was too much to put down for the debenture stock. It was obviously in the interest of the Committee to practise the very strictest economy.

Cross examined by Mr. Fitzgerald, witness said the promoters came to Parliament now because in 1896 they were not able to get the sewage farm. They were taking 62 acres; the quantity taken in 1896 being between 360 and 380 acres. They were adding 60 acres to the size of the reservoir. He was in the Committee Room during the inquiry in 1896, and remembered that clause 60, which said that water should not be pumped from the subsoil, was inserted after full discussion. This clause was not inserted in the present Bill; and the result would be that the restriction imposed in the case of the authorized reservoirs would not apply to that part which would be provided under this Bill. Cross-examined by Mr. Daly, on behalf of the Stanwell Parish Council, witness said that though the proposed footpath over the reservoir would entail a longer walk to foot passengers, it would not cause very great inconvenience, as the road was not very largely used. To run a bridge over the reservoir in the position occupied by the present footpath, would be very expensive. It would be five-eighths of a mile in length, and would be of no use to the works. He thought it a ridiculous proposal. Mr. Danckwerts cross-examined witness as to the alleged nuisance which would be caused to the school of the West London School District Board; and Lord R. Cecil also cross-examined him on behalf of the Middlesex County Council.

Mr. Littler, in reply to the Chairman, stated that he should be willing to introduce a clause in the Bill similar to clause 60 of the Act of 1896; and the Committee then adjourned for luncheon. On re-assembling, Mr. Daly said he had instructions to withdraw the opposition of the Stanwell Parish Council; and Mr. Littler announced that he had received a telegram from the Staines Urban District Council acquainting him with the fact that they had obtained a site for their sewage farm, and so would not require either of those named in the Bill. Petitioners were, therefore, in a position to ask the Committee to declare the preamble of the Bill proved.

The room was cleared; and after a short consultation, the Chairman announced that the Committee had decided to pass the preamble of the Bill, on condition that neither of the pieces of land mentioned were required by the promoters, and subject to the insertion of a clause similar to clause 60 in the Act of 1896. The clauses were then gone through, and the Bill was ordered to be reported to the House.

LEGAL INTELLIGENCE.

Another Claim Arising out of the Poplar Gas Explosion.

In the Queen's Bench Division of the High Court of Justice last Thursday, Mr. Justice Lawrance and a Special Jury had before them the case of *Litson v. Poplar Board of Works*. It was an action in which the plaintiff claimed compensation for personal injuries caused by an explosion. A claim made by other parties in connection with this explosion was before the Court on Dec. 6, 1897, as reported in the "JOURNAL" at the time (Vol. LXX., p. 1293). Mr. Atherley Jones, Q.C., and Mr. W. M. Thompson appeared for the plaintiff; Mr. Kemp, Q.C., and Mr. Montagu Lush represented the defendants. The plaintiff was a sawyer, who had for the best part of his life been employed in the shipbuilding yard of Messrs. Green at Blackwall, and he also kept a tobacconist's shop in High Street, Poplar. In addition to these things, he was employed as a runner by a bookmaker. On the afternoon of Nov. 6, 1896, the plaintiff passed through Wade's Place to go to Sherbet Street, to see the bookmaker in question. On his return journey, while he was again passing through Wade's Place, he said an explosion occurred behind him, and was followed by a second one in front of him. The latter blew up some of the flagstones, one of which struck him upon the knee, and dashed him against a wall. The injury to the knee continued down to the present time. There was not now full use of the leg; and, though there was improvement, it was probable that it would be long before there was complete recovery. The case for the plaintiff was that the explosion was one of gas, and was caused by the defendants having used so heavy a roller in repairing the road that a pipe became broken and allowed the gas to escape. For the defence it was contended that the plaintiff was not present at the time of the explosion, though he might, with other people, have rushed upon the scene of the mischief, and might probably have somehow met with injury while there. It was also said the defendants had recompensed all the injured they thought they were bound to compensate. The Jury found a verdict for the plaintiff, with £300 damages.

Action for Alleged Damage Caused by the Morley Corporation Water-Works.

In the Chancery Division of the High Court of Justice last Thursday, Mr. Justice Byrne gave judgment in the case of *Fielden v. The Mayor and Corporation of Morley*, in which the plaintiff, a landowner in Yorkshire, applied for an injunction to restrain the defendants from pouring water on to his land, some of which they had taken under an Act passed in 1890 authorizing the construction of certain works for the supply of water to the inhabitants of Morley. Mr. Cozens Hardy, Q.C., and Mr. Clare appeared for the plaintiff; Mr. Eve, Q.C., and Mr. Parker represented the defendants. The plaintiff relied partly on section 18 of the above-mentioned Act, which provided that the Corporation should construct, maintain, and keep the catchwaters, conduits, and lines of pipes for conveying the water through his estate water-tight, and should from time to time make good any damage done to the estate, or the owner or his tenants, by reason or in consequence of the leaking, overflow, or failure of any of the works. On the land acquired from the plaintiff the defendants constructed an open conduit to catch the water coming down from the ground above, and convey it to a well, from which it passed into the reservoir; but for some distance before reaching the well, the conduit was arched over, and formed a culvert. As originally constructed, there was no provision for overflow; but subsequently to the work having been inspected by the plaintiff's Engineer, in company of the Engineer for the defendants, a bye-wash was made a short distance from the opening of the covered culvert. It was this of which the plaintiff complained. On June 26, 1895, there was an unusually heavy storm; and a great deal of water poured from the catchwater on to his land. His Surveyor, going soon afterwards to inspect the place, found that the bye-wash had been constructed, and also that a quantity of stones and sand had been placed at the entrance to the culvert, the effect of which was to prevent the water passing, and so cause it to overflow and injure the land. It was submitted, first, that the defendants had no right, under the Act, to construct the bye-wash at all; secondly, that, even if they had, they had no right to stop up the channel with stones and sand, so as to exaggerate the effect of the overflow; and, thirdly, that they had trespassed on plaintiff's land in the construction of it. For the defendants it was contended that the bye-wash was a proper and necessary work, appurtenant to the conduit; that it was made in the natural and proper place; and that no damage whatever had been caused to plaintiff by its construction. So far, indeed, from their works doing any injury to his land, they had reduced the damage which would otherwise have occurred in case of storms. His Lordship decided that the bye-wash was properly constructed, was in the right spot, and did not infringe on the condition that the catchwater was to be constructed and maintained water-tight. If any damage was caused by the overflow, the remedy would be the one provided by section 140 of the Railway Clauses Consolidation Act. The plaintiff's action failed, and must be dismissed. On the application of Mr. Eve, on the authority of a recent decision by Mr. Justice Romer, his Lordship gave the defendants costs as between solicitor and client.

The Lighting of the Margam District.—The question of public lighting has for some time engaged a Committee of the Margam Urban District Council; and they have lately submitted a further report to the Board, who have been unable to come to terms with the Aberavon Corporation for the supply of gas. The Committee had considered the question of lighting the district by means of oil-lamps, the cost of which, it was estimated, would be £2 5s. to £2 10s. per lamp. The Town Clerk of Aberavon (Mr. M. Tennant) offered, on the part of the Gas Committee of the Corporation, to lay the necessary mains, and supply gas for the public lighting at 3s. 2d. per 1000 cubic feet; and he expressed the desire of the Committee to meet the District Council in the matter. The Surveyor is to report on the cost of lighting the most populous portions of the district with oil.

MISCELLANEOUS NEWS.

THE NEW WORKS OF THE GRANTHAM GAS COMPANY.

Inauguration of the Retort-House.

Since the appointment of Mr. R. G. Shadbolt to be Engineer and Manager of the Grantham Gas Company, a complete scheme for the remodelling of the works has been adopted by the Directors, and will be gradually completed as opportunity offers. A beginning was made by the erection of a new retort-house to supersede the old structure, which, with the adjacent buildings, will eventually be demolished to make room for a new purifier-house, engine and exhauster rooms, &c. The new retort-house, with adjacent coal-store, has already been completed; and Mr. Shadbolt took the opportunity last week of inviting a number of his professional friends to inspect the installation of retorts, heated by Chester's regenerative furnaces, which has already been started successfully to work. Last week was chosen for this particular purpose in view of the fact that a gas-stove exhibition had been arranged to be held in the Exchange Hall; the goods on view being principally those of Messrs. Charles Wilson and Sons, of Leeds, in conjunction with Messrs. Alder and Mackay, of Edinburgh. Those who received invitations first of all inspected the stoves and other goods shown at the Hall, and were afterwards conveyed to the retort-house, where there was a minute inspection of the new building with its adjuncts; and many favourable comments were made as to the completeness of the arrangements—more especially when contrasted with the somewhat antiquated condition of the other portions of the plant. The Chairman of the Company (Mr. J. W. Jeans, J.P.) was present, together with some other members of the Board—Mr. J. G. Thompson, the Deputy-Chairman, and Messrs. A. Hutchinson and F. W. Thompson.

The retort-house above referred to is built very substantially, is of neat design, and has a pleasing appearance. The coal-store and retort-house are combined under one roof, which covers the bench and is 80 feet span. It is made of flat steel. The charging-floor is raised about 3 feet above the outside ground-line, so as to be level with the coal-trucks, which run on either side of the charging-floor; one set of rails on the outside of the house being covered by a light lean-to roof, and another set running through the house, and dividing it from the coal-store. The installation consists of seven through arches. Owing to want of space on one side, and the existence of a large culvert drain on the other, the underground flue is dispensed with, and the waste heat is conveyed into three separate chimneys by means of pockets in the pier walls. The settings consist of eight retorts 20 ft. by 22 in. by 15 in. Each bed is fitted with a separate hydraulic main and valve. The bench, fittings, and roof have been carried out by Messrs. R. Dempster and Sons, Limited, of Elland, to the designs of Mr. Shadbolt; and it must be acknowledged that the work reflects the greatest possible credit to all parties concerned. The retorts heat evenly end to end; and altogether give great satisfaction. The general dimensions of the building are 130 feet and 104 feet long and 80 feet span; and the total capacity of the bench is 900,000 cubic feet per diem, space being also reserved to increase this by 50 per cent. at any future time.

After the inspection, the party were driven to the Guildhall, where luncheon was served; and thereafter a short list of toasts was gone through.

SOUTHAMPTON GAS COMPANY.

The Corporation and the Company's Bill—The Half-Yearly Report.

At the Meeting of the Southampton Borough County Council last Wednesday, the Town Clerk presented a report of the Parliamentary Committee, containing a settlement of terms between the Committee and the Gas Company, in connection with the Bill of the latter now pending before Parliament. The Town Clerk said he was happy to report that, after considerable negotiation with the Company, they had arrived at a settlement. The Company agreed that the price of gas should not exceed 3s. 6d. per 1000 cubic feet throughout the area of the borough; that they would undertake to equalize the price at present charged to consumers throughout the borough within a period not to exceed ten years; and that they would not, for the purpose only of effecting such equalization, increase the present price of 2s. 6d. per 1000 feet to consumers in the old borough. This undertaking was not, however, to prejudice in any way the right of the Company to raise the price of gas in any portion of the Company's district in case the Directors deemed it necessary. The Company further agreed to increase the illuminating power to 15 candles, to repeal the twelve hours' notice of testing, and to pay the Corporation costs, which are estimated not to exceed £100. The Mayor (Alderman G. J. Tilling) moved that the terms be accepted, and remarked that they could not have done better had they gone to Parliament. He thought they might congratulate themselves that so satisfactory a conclusion had been arrived at. Mr. C. H. Hardiman seconded the motion, remarking that the Company's Directors had met the Council in a very reasonable manner. Mr. Dunsford asked if they were to understand that they were to wait ten years for a reduction. The Mayor replied that the Company pledged themselves to reduce it as soon as it was in their power. The report was unanimously passed.

The report of the Directors of the Company for the half year ending Dec. 31 last has been issued. It states that the amount available for dividend is £7939; and the Directors recommend that £374 be drawn from the reserve fund in order to pay the maximum dividends amounting to £8313. Referring to the recent assessment appeal, the Directors state that the reduction of £1836 made by the Recorder in the assessment will, it is estimated, save the Company about £800 per annum in local rates. The costs of the appeal and reference were ordered to be paid by the Guardians. During the half year there was an increase of 5,225,000 cubic feet in the quantity of gas sold, as compared with the December half of 1896. For the whole year the increase in the gas manufactured was 22,960,000 cubic feet.

THE SUPPLY OF GAS AND ELECTRICITY IN ROME.

The New Concession of the Anglo-Romano Gas Company—The Company's Annual Report.

During the past few months the subject of the revision and extension of the concession of the Anglo-Romano Gas Company has very much engaged the attention of the Company's representatives and the Municipal Council. The Company, it may be remembered, supply the electric light; and it was the expiration of their contract with regard to this illuminant which led to a reconsideration of the terms of the gas concession, which had twelve years to run. As the result of the negotiations above referred to, an agreement has been entered into which embodies the following changes: The Municipality formerly paid 25c., and the public 29c. per cubic metre for gas used for lighting, and 22c. per cubic metre for that employed for cooking, heating, and the production of motive power; being at the rate of 5s. 8d., 6s. 7d., and 5s. per 1000 cubic feet. Under the new concession, these prices are reduced to 18c., 23c., and 18c. (4s. 1d. and 5s. 2½d. per 1000 cubic feet), respectively, or about 25 per cent. less than the old figures. These reductions are calculated to effect a saving of about 280,000 lire (£11,200) per annum to the Municipality, and of 580,000 lire (£23,200) per annum to private consumers. In addition to this, further reductions are to be made, in the event of the consumption of gas exceeding 16 million cubic metres, or about 565 million cubic feet per annum, at the rate of 1c. per cubic metre (in round figures 2¾d. per 1000 cubic feet) for every additional 2 million cubic metres used. But whether or not this increase in consumption takes place, the supplementary reduction is to be made every seven years. In this way the Municipality and the general body of consumers will together realize a saving of not less than 12,000,000 lire (£480,000) in the next thirteen years.

With respect to electric lighting, the Company's monopoly will be abolished for the private consumption; it being made permissible for others to obtain power to lay cables for private lighting in any of the streets and squares of the city where the Company have not already conductors for the public lamps. These places may, however, be crossed by cables not belonging to the Company, on permission being obtained from the Municipality. Under the old concession this was prohibited. Nor will there be any monopoly in the case of the supply of electricity for motive power; but that which is intended for this purpose is not, either directly or indirectly, to be employed for lighting streets and squares where the Company have the public electric lighting. With regard to those which are not controlled by the Company, it will not be allowable for others to submit tenders except in the case of recognized public utility. Before accepting such tenders, the Company are to be invited to suggest improvements, with the object of obtaining the concession whenever it shall please the Municipality to adopt the scheme thus improved. Existing prices of 40c. per lamp-hour for the Municipality, and 11c. per hectowatt-hour for the private consumers, are to be reduced to 30c. in the former case and 8c. in the latter. The saving thus effected will, it is calculated, amount to 70,000 lire (£2800) for the Municipality and 330,000 lire (£13,200) for the private consumers. The new prices will be subsequently reduced by 1c. and 2c. for public and private consumption after five and ten years; and a final reduction will be made beyond a consumption of 35 million hectowatts.

Subject to these new conditions, the contract for gas lighting will be extended for 25 years, with the addition, however, of the necessary reservations for competency and rights, and relieving the Municipality of all responsibility. The electric lighting contract will be renewed for 25 years, with the same reservations. Some of the supplementary conditions of the new contract place special restrictions on the Company. By article 4 it is specified that in the event of experiments and new inventions demonstrating the convenience or utility of changing the present system of the production, purification, and distribution of gas, or employing new types of apparatus, &c., the Municipality are to have power to insist on their application and use; making a proportional allowance, or receiving such allowance in the case of a reduction being effected in cost. In the event of the invention of any system of producing illuminating and heating gas which is capable of yielding better technical or economical results than the present one, the Municipality are to have the power to adopt it at any time for public or private purposes, totally or partially; but the Company are to have the right of preference, on equal conditions, to employ the system within six months, without any compensation or indemnity of any kind. If the Company do not claim this right, the Municipality may abandon, temporarily or definitively, the system of gas lighting in use, and adopt the new one without granting any indemnity to the Company. By article 10, the Company agree to construct new works in the upper part of the city when they are deemed necessary by the Municipality. According to article 19, in the event of tenders being submitted for public electric illumination in other streets and squares than those supplied by the Company, the latter are to be invited to make improvements, with a view to obtaining the concession, without prejudice to the authorization hitherto given by the Municipality for private lighting in the places in question. By article 20, the Company are to have the right to carry their pipes and wires up to the meter and internal fittings; but consumers are to be at liberty to put in internal plant through the agency of the Company or other persons. Under article 23, the Company undertake, in order to ensure better private electric lighting, to establish within eighteen months a new system of electric transmission from Tivoli to Rome, of not less than 1500-horse power; and when three-fourths of the capacity of this second installation are in use, the Company will establish a third installation, or provide power in some other way.

In connection with the foregoing, it may be of interest to give some particulars from the last annual report of the Company. In the first place, it is stated that less gas was sold in the past financial year. The 13,500,683 cubic metres (about 477 million cubic feet) supplied—*i.e.*, 3,879,864 cubic metres to the Municipality and 9,620,819 to private consumers—shows a decrease, as compared with the preceding twelve months, of 120,217 cubic metres (4,244,000 cubic feet) in the case of private, and of 58,185 cubic metres (rather more than 2 million cubic feet) in that of public consumption. Thus as the population of the city increases (it is stated that there are now about 489,000 inhabitants) the sale of gas diminishes. What are the causes of this? In the first place, the Municipality are studying economy. There are nearly 1000 gas-jets, out of the total of 8214, which are not used. Besides, there were no illuminations last year; and this caused less consumption. Among private consumers, economy, for many reasons, is even more conspicuous. As to the causes of the reduced gas consumption, foremost stands the adoption of electric lighting, which, though progressing slowly, owing to its high price (11c. per hectowatt-hour), has taken away a certain number of gas consumers. There are in Rome 54,562 electric lamps of various intensities; being equivalent to 56,698 lamps of 16-candle power. Then there is the saving in consumption effected by the employment of the Welsbach or other kinds of incandescent burners, by the aid of which more light is obtained at less expense. As this system of lighting daily grows more general, it follows that the total consumption of gas necessarily becomes much smaller. Finally, there is the fact that everyone is endeavouring to curtail expenditure, because, through Government taxation, gas is dear for the private consumer. These are the three reasons which explain the falling off in the consumption of gas. Electric lighting has remained almost stationary. The Company, who supply the electric tramways with motive power, have, however, increased their sale of current.

GAS AND ELECTRIC LIGHTING AT BANGOR.

A Special Meeting of the Bangor City Council was recently held, under the presidency of the Mayor (Mr. H. Hughes), to consider the minutes of the Lighting (Gas and Electricity) Committee, which recommended the adoption of the report of a Sub-Committee on the question of the lighting of the city. They recommended the erection of a new two-lift gasholder (capable of containing 108,000 cubic feet of gas) in the tank of the present single-lift holder; and the provision of a washer-scrubber capable of purifying a million cubic feet of gas in 24 hours, at a total estimated cost of £2900. They also recommended the erection of electric lighting works, at a cost not to exceed £10,000; the cables to be of sufficient size to supply Upper Bangor also when required. Dr. Grey Edwards, the Chairman of the Committee, in moving the adoption of the report, said it was, of course, in the nature of a compromise, which the Committee thought was honourable to all parties concerned, and would be of great benefit to the ratepayers generally. Referring to the electric lighting scheme, he said it was obvious that in the present state of the finances of the town generally it would scarcely be right to call upon the ratepayers to bear the burden should there be anything like a loss upon the installation. They were reluctant to dispose of their Provisional Order to any company or outside authority; and therefore a number of influential ratepayers had signed a bond guaranteeing to be responsible, in the event of there being any deficiency, for about £500 annually for five years, according to the amount standing opposite the name of each signatory. The bond already covered a sum of £515; and it was hoped that it would be still further increased. The extreme cost of the electric light scheme suggested would be £10,000; while it would take about £3000 more to extend the mains to Upper Bangor. Mr. T. J. Williams moved an amendment that the recommendations concerning the gas-works be adopted, and that the one respecting the electric light be deferred for further consideration. He thought the ratepayers should be consulted on the scheme before the recommendations of the Committee were adopted. He did not, however, anticipate that, after the whole scheme had been explained to the ratepayers and the guarantee bond had been obtained, there would be any difficulty. Mr. J. Williams seconded. The debate was continued for some time, and eventually it was intimated that Mr. Williams had only seconded the amendment for the sake of having a discussion. He therefore withdrew; and the amendment dropped. The minutes of the Committee were then adopted; the only dissentient being Mr. T. J. Williams. On the motion of Dr. Grey Edwards, resolutions were passed to apply to the Local Government Board for sanction to borrow £2500 for the new gasholder, £500 for the washer-scrubber, and £10,000 for electric lighting purposes.

SAN PAULO GAS COMPANY, LIMITED.

The Terms of the New Contract.

The Annual Meeting of this Company was held yesterday week, at Winchester House, Old Broad Street, E.C.—Mr. D. M. Fox in the chair.

The Secretary (Mr. G. H. Rogers) having read the notice convening the meeting, the report and accounts were submitted. The most important matter dealt with in the former was the conclusion of the new contract with the Government of San Paulo, details respecting which will be found in the Chairman's speech. The revenue account showed a profit on the year's working of £24,825, which, added to £1479 brought forward, made a total of £26,304 available for distribution. Out of this an interim dividend of 5 per cent. had been paid; and the Directors recommended the declaration of a final dividend at the same rate.

The Chairman, in moving the adoption of the report and accounts, congratulated the shareholders upon the position in which they now found themselves. They had obtained a new contract; and it came into force at the beginning of this year. It was an immense relief to the Board to have reached this satisfactory result, as the negotiations had been a source of very great anxiety to them. He might on this occasion take a brief review of the past; and then say a few words as to the present position and the prospects of the Company. The old concession was granted in 1863 for 25 years; and consequently it would, under ordinary circumstances, have come to an end in 1888. But there was some delay in the formation of the Company; and, in consequence, a few years ago there was a dispute as to when the contract should terminate—the Government said one date, and the Company said another. This was one of the first difficulties they had to overcome. Happily, instead of entering into contention with the Government, the Directors made a compromise with them to this effect—that the concession should end at the date claimed by the Government, but that the contract should be extended for a period, during which the Government should be at liberty to call for tenders. In this way, under the name of extension, the Company obtained the full term for which the Directors contended. One of the

conditions attaching to the extension was that, prior to calling for tenders, a valuation should be made of the Company's property. This was done; and the valuation was such a liberal one that it was almost a matter of indifference financially to the Company whether they went on, or whether some other company took over the supply of gas, and paid them the amount of the valuation. Of course, it was much better, with a satisfactory contract, for the Company to go on, in order to secure such a return on the money invested as they were justified in expecting. The conditions under which tenders were invited by the Government were, owing to the difficulties of exchange and other matters, so onerous that no offers were received; and the ground was then free for negotiation between the Government and the Company. These were of a protracted nature; and finally resulted in a contract which was equally just to both parties. It had a duration of thirty years from Oct. 13, 1897. On the expiration of the contract, should the Government not renew it, they must pay the Company in gold the value of the plant. This had placed the undertaking on a firm basis, and with a good future before it. In making a contract of this kind, of course there had to be a certain amount of give and take. The first important element they had to consider was the price at which they could arrange to sell gas under a new contract. They had to make a reduction; and the price was fixed in gold—that was, at 27d. per milreis—the same as in the old contract; but it had been reduced from 260 reis per cubic metre to 170 reis. They had to make this concession for many reasons. In Rio de Janeiro, for example, the price of gas was even lower; and it was quite impossible for them to maintain the old price. In order that the shareholders might form some idea of what these prices meant, he stated that 260 reis per cubic metre represented in gold 16s. 6d. per 1000 cubic feet; and 170 reis was equal to 10s. 9d. per 1000 cubic feet, so that the reduction they had made was equivalent to about 33 per cent. It had been really impossible to put into force, in the case of the private consumers, the high price they had had power to charge; but they had received it from the Government. Under the new contract, both the Government and private consumers would pay the same rate. Therefore he did not think there would be any great reduction in the Company's returns—not more perhaps than 6 to 10 per cent. in the first year. The price of 170 reis at 27d. per milreis was equal to 260 reis with the exchange at 18d. Notwithstanding this reduction in price, the Directors had every confidence in being able to maintain the dividend. There had been heavy charges in the past, which had now ceased; and, having secured the new contract, the Company were warranted in spending money in improving the works. The Directors would use every endeavour, under the guidance of their Consulting Engineer (Mr. A. F. Phillips), to adopt the most modern practice, and to take advantage of every economy that science had suggested, in their manufacture. They had been suffering lately from excessive unaccounted-for gas, caused by the drainage works which had been carried out during the past two or three years. The trenches had been dug in a most careless manner; the gas-mains had been interfered with; and, owing to the improper re-filling of the trenches, there had been considerable settlement—all of which had occasioned a great waste of gas. The Directors had had under consideration the question of introducing carburetted water-gas plant, which would effect an economy by saving cannel and by reducing the quantity of coke for sale. At present, however, there was some difficulty regarding the cost of the oil which would be required. The Company had reserved to them under the new contract the preference of electric lighting; and they must be consulted in regard to any proposal in this direction. Speaking of the future, he stated that, when the old concession was granted to the Company, there were only 500 street-lamps, and now there were above 3000. Last year the increase in the public lighting was something like 18 per cent. The population was also rapidly advancing. He knew the place some forty years ago; and there were then only 20,000 inhabitants, while now there were over 200,000. As to the accounts for the year, he stated that the receipts in currency were higher than they had ever been; but the sterling receipts had been affected adversely by the low exchange, owing to the fact that they had not been able to charge the private consumers the maximum rate according to the exchange. The Chairman proceeded to refer to the great responsibility which had rested upon the shoulders of their Manager at San Paulo (Mr. M. Henrick) during the recent negotiations, and said that the Company had every reason to be grateful to him for the manner in which he had fulfilled his most trying task. The Directors were proposing to give him six months' holiday on this side. He also praised the work of Mr. Wood and the staff, and recognized the fair way in which the Government had concluded the contract. Regarding the proposed extensions, he said the money they would require would not exceed £50,000; and it was quite likely £30,000 would suffice. It was proposed to raise this by the issue of 5 per cent. debentures, which it was probable would be offered to the shareholders at par.

Mr. J. R. TYNDALE seconded the motion.

Mr. ROBINS, having commented upon one or two items in the accounts, suggested that "Caution" should be the watchword of the Directors in spending money in the future. He also spoke of the enormous change which had taken place in the affairs of the Company. For this they were largely indebted to Mr. Fox; and later in the proceedings he should propose that something more substantial than a vote of thanks should be placed to the credit of those who had brought the change about.

Mr. FOWLER, while acknowledging that the thanks of the shareholders were due to the Directors for the work they had done, thought that (their fees having been raised only a few years ago from £600 to £1000) their reward was ample. He severely criticized the management of past Directors, and declared that they were not yet "out of the wood." The state of the exchange was a serious question; and he saw from the accounts that the private lighting had diminished by nearly £9000.

The CHAIRMAN did not think that any good purpose would be served by dwelling on the past management of the concern, beyond saying that the late Directors had very bad times to contend with. He admitted that the falling off in the private lighting was an ugly feature; but, under the new contract, they would not be subject to such a depreciation of exchange.

The motion was unanimously carried.

The dividend recommended having been declared,

The out-going Director (Mr. Tyndale) was re-elected; the appointment of Major Webb as a Director was confirmed; and the Auditors were also re-elected.

A resolution was next submitted having for its object the alteration of the regulations of the Company by the adoption of amended Articles of Association. The alterations were principally in matters of detail; and, after a short discussion, the resolution was agreed to.

Mr. ROBINS followed with a motion to the effect that, having regard to the great services rendered to the Company by the Chairman in obtaining a new concession, and generally in placing the affairs of the Company on a sound basis, the sum of 300 guineas be awarded him.

Mr. FOWLER said he willingly seconded the motion, as he had previously spoken under the misapprehension that Mr. Robins was suggesting an increase in the Directors' fees.

The motion was unanimously passed.

The CHAIRMAN, in acknowledging the gift, said the resolution had taken him quite by surprise; and he very greatly appreciated the unanimous way in which the shareholders had received it.

This concluded the proceedings.

BUENOS AYRES (NEW) GAS COMPANY, LIMITED.

The Annual General Meeting of this Company was held last Thursday at the London Offices, 1, East India Avenue, E.C.—Sir WILFORD BRETT, K.C.M.G., in the chair.

The SECRETARY (Mr. E. W. Layton) having read the notice convening the meeting,

The CHAIRMAN said the Directors had to report, as the result of the year's working, a profit of £52,848, to which had to be added the balance of £3990 brought forward from the previous year; making a total of £56,838. After payment of the fixed charges, depreciation of services, &c., and the cost of various improvements, £34,681 remained to be dealt with. From this £12,500 had already been paid to the shareholders as an interim dividend; and the Directors recommended that a final dividend of 7s. per share (or £17,500) be declared—making 6 per cent. for the year, and leaving £4681 to be carried forward. The 6 per cent. mortgage debentures, which fell due on Jan. 1, had all been paid off, with the exception of such as were converted into new 4 per cent. debenture stock; and the balance due on the latter had since been paid up, making a total of £220,000. The public lighting service was still being continued by the Company; and during the year, the works had been kept in good repair, and were in thorough order for the coming winter. In spite of certain adverse circumstances—for instance, the increase in taxation, loss by permutation, and higher freights for coal and oil—he thought the shareholders would say that a fair balance had been made on the year's operations. The municipal taxes had been raised from 1c. per cubic metre to 2c. Using less coal and cannel, they had made during the year an additional 20 million cubic feet of gas. This was very much to the credit of the gas-making department; and when they looked back to former years, the improvement was still more conspicuous. They had also been effecting great improvements in the plant, with the view of making themselves in some measure independent of the growing demand for higher wages, which existed in Buenos Ayres as elsewhere. The Directors had introduced carburetted water-gas plant. They entered into a contract for the apparatus with Messrs. S. Cutler and Sons; and it was now in working order. At first, some difficulty was experienced, as was frequently the case with new machinery; but it was now satisfactorily at work, and was making a great deal of gas. This introduction of water gas had necessitated additional storage for oil; and they had now tanks available for the purpose to the extent of 1500 tons. Other works had also been pressed upon them; but they all were much to their advantage. For instance, the Municipality had decided to make great improvements in some of the roads of the city. The one that ran alongside the works was always in a dreadful condition; and the Municipality resolved to raise it. This had entailed the raising of the floors of the buildings and plant on the works, at considerable expense. Formerly, when the road was flooded, gas making used to be stopped for hours. Now this was all changed; and raising the road had proved a great advantage both to their customers and to themselves—not only on account of the traffic to and from the works, but there was no risk of gas making being stopped in future in consequence of flooding. The distribution system had also been re-arranged; and the result was they had had in the past year a greater number of customers than in any former year but one—viz., 1889. This was very satisfactory. The leakage question was always a matter of great anxiety to the Directors; and they had had a thorough overhauling of the mains and services under the superintendence of their Consulting Engineer. On his recommendation, no less than 7741 dead ends had been cut off and stopped; and they had taken advantage of the relaying of roads by the Municipality to make a careful examination of the mains, with the result that they were found to be very free from leakage. There was no doubt that, if they reduced the leakage from 15 to 10 per cent., in three years they would save the whole of the expense which they had incurred in carrying out this work. They had also furnished their shops with the best material and the most modern plant; and this would result in great benefit to the Company, and was a source of much satisfaction to their officers. In making an analysis of the receipts and expenditure in comparison with 1896, he said the former were £8547 more, and the latter £10,211 more. This increase in the expenditure was accounted for by the heavy works they had undertaken. Of course, it was a debatable question whether some of these—for instance, the raising of the ground, the new station meter, the water-gas plant, and the balance of the cost of the oil-gas plant—might not have been charged to capital; and also whether the cost of the renewal of gasholder No. 1, and lifting the roofs of the buildings, might not also have been charged over a series of years. But the Directors came to the determination—they thought it better in the interests of the Company—that all these expenses should be wiped off, and charged to the past year. This had been done; and he thought the course taken by the Board would have the approval of the shareholders. The gas-rental had advanced by £9586. This was very satisfactory, because while there had been this increase, the coal carbonized had been considerably less. He might be asked why, if the quantity of coal used had been so much less, the charges were much higher. The answer was that freights had increased so much that they made up the difference—they were something like 3s. per ton more, which represented

a large sum on the heavy supplies of coal sent out. Rents, rates, and taxes had also increased. They now amounted to £12,222, which was equivalent to 8¼d. per 1000 cubic feet of gas sold. During the last two or three years, the Company's position had no doubt very much improved. By adopting Cutler's patent, by keeping a large stock of coal in hand, and in other ways, they had made themselves to a certain extent independent of fluctuations in freights. They did not like to live from hand to mouth; and they were now in a position to send out their material when freights were low. Electricity was no doubt a competitor; but gas could do a good many things that electricity could not. The Directors, however, would watch with interest and care the course that electricity pursued; and they would do their best to act in accordance with its movements. He considered that their business was now established in a firmer position than it had ever been in before; and he thought he might congratulate the shareholders upon that fact—indeed, he had never felt more hopeful than he did that day. Their Manager (Mr. Lee) was now home for the benefit of his health. He had been a faithful servant; and he (the Chairman) hoped the change to this climate would do him much good, so that he would be enabled to return to Buenos Ayres in renewed health. He concluded by proposing the adoption of the report, and the declaration of a dividend for the year of 6 per cent., 2½ per cent. of which has already been distributed.

Mr. F. J. Heseltine, the Managing-Director of the Company, seconded the motion.

Mr. S. Spencer said he thought the new plant should be charged to capital and not to revenue, as it could hardly be called a renewal. In his opinion, the Directors had acted very wisely in regard to the conversion of the debentures, as the change would strengthen the position of the ordinary shareholders very considerably. He also congratulated the Board upon the sound position in which the Company stood at the present time.

Mr. Cuff asked if the war was likely to put the Company to any great expense by raising the price of coal, or whether they ran any risk in sending supplies over.

The Chairman, in reply, said the charge for Cutler's patent was not a very large one; and, generally, it was considered better to keep the capital account as low as possible. He could not answer Mr. Cuff's question. They had a large stock of coal at Buenos Ayres; and thererefore they would be able to temporize in sending out supplies.

The motion was unanimously carried.

On the proposition of Mr. J. C. im Thurn, seconded by Mr. Cuff, Sir Wilford Brett was re-elected to his seat at the Board, as was also Mr. Pinsent, on the motion of Mr. R. Nesham, seconded by Mr. Spencer.

The Auditors were also re-appointed; and the proceedings concluded with a vote of thanks to the Chairman and Directors, the local Committee, the officers, and the staff.

THE CONGRESS OF APPLIED CHEMISTRY.

The third International Congress of Applied Chemistry will meet this year at Vienna, from July 28 to Aug. 2. A local Organizing and Reception Committee has been formed from the leading and most influential representatives of science and technology in Vienna, and every arrangement is being made for affording facilities for visitors to inspect the various objects of interest in which the Imperial City on the Danube abounds.

In particular, a few of the arrangements of more special interest to readers of the "Journal" may be mentioned—viz., inspection of the Vienna Water-Works and of the building of the city gas-works; brick-works; the mineral-oil refinery; and the installation of water gas at the Imperial General Hospital. Vienna, too, will be *en fête* this summer in consequence of the Jubilee celebrations of the Emperor, Franz Josef I., who will shortly complete his fifty years' reign. A great exhibition is being held as a part of the commemorative programme. During the week of the congress, other learned bodies will be holding meetings in Vienna. Contributions to the various discussions, either in writing or orally, are allowed to be made in English, French, or German. After a preliminary general meeting, the congress will divide into a number of sections, the most interesting of which to those engaged in gas and water technology is Section VII., which deals with the inorganic chemical industry. Under this heading, the chemistry of illumination and its various branches come up for consideration. The following subjects are already announced as being on the programme: "The Present Position of the Gas Lighting Industry;" "The Chemistry of Flame (with demonstrations);" "The Measurement of the Intensity of Light (with demonstrations);" "The Present Position of the Petroleum Trade;" "The Employment of Water Gas in Metallurgical Processes;" "The Place of Chemistry in the Tar Industry."

ELECTRIC LIGHTING NOTES.

The Electric Lighting Committee of the Hull Town Council had under consideration last Thursday a proposal to extend the electric lighting of the city into East Hull, at an estimated cost of £25,000. When the extension is made, the circuit of the city will have been completed.

The question of providing refuse destructors at St. Helens has been attracting considerable attention in the town; and there has been some opposition—not so much against the system itself, as against the locality which has been chosen for the destructors. For carrying out the scheme, application was made by the Town Council for sanction to the borrowing of £13,000; and the usual inquiry was held by Colonel J. T. Marsh last Thursday. According to a statement made by the Town Clerk (Mr. Jeeves), it is estimated that by means of the destructors sufficient electricity will be generated for the working of the whole tramway system, even when it is extended as contemplated by the Corporation Bill now before Parliament. The opposition was represented by Counsel.

A meeting of Sheffield owners and ratepayers was held last Tuesday for the purpose of consenting or otherwise to the promotion of a Bill to confirm the agreement for the purchase of the undertaking of the Electric Lighting Company. The voters were few; but those who pronounced against the Bill numbered 53 or 54, while those who were prepared to consent to it only mustered 48. A poll is therefore to be taken, at an expense, it is computed, of £1000. The opponents, it is asserted are all interested in one branch of trade—electrical wiring and fitting; and they objected to the Corporation undertaking the same business, as they would be enabled to do under the powers already possessed by the Company. It was stated by one of the speakers for the Corporation that nearly everybody in the city was of opinion that what was proposed was a wise and proper course to pursue; but the ratepayers did not endorse this by attending the meeting in large numbers—the total present being only about 100. The following day the City Council met, and confirmed previous resolutions as to the promotion of the Bill. The whole of the discussion turned on the previous evening's defeat; and if it has no other effect, the Council will have learnt that care must be taken on such occasions to have a sufficient attendance to upset any little plot on the part of people who are antagonistic to their proposals. Letters have appeared in the local press which indicate that some of the leading electrical firms strongly condemn the course taken by the opposition at the ratepayers' meeting.

A deputation from the Midland Electric Corporation attended the meeting of the Tipton District Council last Tuesday, for the purpose of making an effort to come to terms with them; but from what transpired, it is likely that the Company's application for a Provisional Order will be dropped. Speaking on behalf of the deputation, the Chairman (Mr. A. Albright) said that, if Tipton opposed, it was highly probable the Company would withdraw their scheme. If they did not get the Order this session, they would have to go over the whole ground again, which he did not think the Company would be prepared to do. Six or eight months had already been occupied by the Company in endeavouring to show the Local Authorities that they were prepared to give them something worth having; and if the Authorities were not prepared to accept the scheme, they would have to take it into another district. Replying to an inquiry, he said it was impossible for the Company to supply the Council with electricity in bulk for lighting purposes at 2d. per unit. The lowest at which they could supply it was 3d. per unit. He suggested that the Board of Trade should be requested to appoint an arbitrator to settle the question of price. It was thought by the Council that the ratepayers would consider they had made a bad bargain if they agreed to pay 3d. per unit, when the Company were prepared to supply electricity to manufacturers for power purposes at 1d. per unit; and the deputation were asked if they would be prepared to split the difference between 3d. and 2d. Mr. Albright said they could not possibly do so. The deputation having withdrawn, the Council passed a resolution to the effect that the Council try to get the price reduced; and that in the event of failure to obtain a concession, an appeal be made to the Board of Trade to appoint an arbitrator to fix a fair price between a maximum of 3¼d. and a minimum of 2d. per unit.

The Corporation of Swansea have at last come to a decision on the subject of an electric lighting scheme for the borough. At a special meeting of the Electric Lighting Committee recently held, a Sub-Committee presented a report on this matter, as well as on an offer made by the British Electric Traction Company, who are going to work the tramway system by electricity, to light the town. Their proposal was to pay to the Corporation £1000 for the transfer of the Electric Lighting Order, and during each year the Company have the right to exercise it 10 per cent. of the gross receipts; the Corporation to have the option to purchase the undertaking whenever the Company's lease is determined. The Sub-Committee informed the Company that they were unable to entertain the terms proposed; and they asked for a further proposal, whereupon the Company asked for a counter-proposal. The Sub-Committee then recommended the Council to erect their own electrical works, combined with a dust destructor, and to offer to supply the Company with electrical energy at 1½d. per unit up to 400,000 units per annum, and 1¼d. per unit for any quantity supplied beyond this amount. They reported that Mr. Manville had further been instructed to revise the plans for the proposed electrical station, with a view to tenders being obtained for the works; and the Town Clerk has been directed to proceed with the application to the Local Government Board to sanction a loan of £60,000 to defray the estimated cost of the proposed station. The Committee asked for power to conclude provisional agreements for the acquisition of the necessary land for the purposes of the scheme. The Town Clerk communicated this offer to the Company, who, in their reply, stated that they were not inclined to enter into a contract for the purchase of current, and enumerated several objections which their Secretary said were sufficient to show the disadvantages they would have to face under an arrangement for a supply of current by the Corporation, even if the supply were at rates as low as those at which the Company could produce the current. A report was presented by Mr. Manville on the capital expenditure necessary for lighting the whole borough by electricity. It was: (1) Capital expenditure for the low-tension continuous-current system, £32,470; (2) capital cost of arc lighting plant in compulsory streets, £1584; (3) cost of low-tension feeders to outside districts, £7227; (4) additional cost for dust-destructor arrangement, if provided, £11,287; (5) cost of site, not ascertained—total, £52,568. The report was adopted with two dissentients. The Committee then sat as the Council; and the Mayor (Mr. J. A. Thomas) moved the final adoption of the report. He strongly advocated the Council going in for electricity and a dust destructor in combination. Then they would, he said, be able to get rid of their town refuse in a sanitary manner; to obtain from it some of the generating power to light the town; and also to provide a day load. He wished it to be distinctly understood that there was no likelihood of the tramway people taking their electricity from the Corporation; and he urged the Corporation not to lease their electric lighting rights to the Traction Company. Captain Sinclair said certain objections he had at one time to the scheme had been removed through alterations and modifications, and therefore he was glad to be able to support the motion. In the first year he believed there would be no loss; and in the second he expected a large profit. As to the dust destructor, he said candidly that he was not keen on it, for he could not bring himself to believe that the town refuse could be dealt with as cheaply by this means as the Borough Surveyor estimated, while in his opinion there were important engineering difficulties. The motion was carried with two dissentients.

COMMENCEMENT OF THE STAINES RESERVOIRS SCHEME.

Cutting the First Turf.

A number of gentlemen professionally connected with water undertakings and engineering, as well as representatives of the Press, accepted the invitation of the Chairman (Mr. Edmund Boulnois, M.P.) and members of the Staines Reservoirs Joint Committee to be present at the formal commencement last Saturday of the great scheme of storage reservoirs which, as our readers will probably remember, the Committee were constituted to carry out. The party left Waterloo Station in a special train shortly after midday; and on reaching Staines they found conveyances waiting to take them to the site of the first reservoir to be constructed, whence they proceeded by a short line of railway to the spot selected for the ceremony of cutting the first turf. On arriving there, Mr. Boulnois briefly explained to the company that they had met to take part in the commencement of a great work, which had received the approval of a former Royal Commission, for making provision for the storage on a large scale of water for the supply of London. The work had been placed in the hands of Messrs. John Aird and Sons; and he asked all present to join in wishing success and good luck to a meritorious enterprise. Mr. John Aird, M.P., then presented Mr. Boulnois with an ebony-handled silver spade, bearing an inscription commemorative of the event, and the names of the principal participants therein. In doing so, he incidentally referred to the works which, as already mentioned in the "JOURNAL," his firm have lately undertaken for the Egyptian Government; remarking that two important schemes of reservoirs—for Egypt and the Metropolis—would be commenced together, and he hoped would be completed together. Mr. Boulnois then proceeded to cut the first turf, fill the ornamental barrow provided for the purpose, and wheel and tip the earth in the usual manner. Cheers were heartily given, and the ceremony closed.

The company afterwards partook of luncheon, served in a marquee on the ground—Mr. Boulnois presiding. After the toast of "The Queen" had been duly honoured, Sir W. Marriott, Q.C., proposed "Success to the Staines Reservoirs Scheme," coupling with the toast the name of the Chairman. Mr. Boulnois, in responding, remarked that Sir F. Dixon Hartland had stated that there was enough water in the Thames to last for a hundred years, if it was only properly taken. The object of the works just inaugurated was to impound the water from that river—thus preventing floods—store, and deliver it, after it had been completely filtered. As there were 1200 million gallons of water going to waste after the London Water Companies had taken their quantity, why they should go 150 or 200 miles away for water which was no better than that of the Thames he was at a loss to imagine. The Welsh scheme was being discredited; and London would eventually be satisfied with the Thames water. The Companies undertook works for which they received no pecuniary return whatever; and yet it was said they were not doing their duty. On the contrary, they were doing the best they could for the people of London; and generations to come would have reason to thank them for providing a wholesome supply of the first necessary of life. With regard to the Joint Committee, there were upon it experienced men thoroughly acquainted with the water question; they had able Engineers; and the names of the Contractors were sufficient to guarantee the success of the scheme. The Committee were celebrating the commencement of an enterprise of no mean character, but one which would prove of vast and permanent benefit to the Metropolis. Mr. John Aird proposed "The Health of the Chairman and Deputy-Chairman of the Committee." The latter (Sir Joseph Savory, Bart., M.P.) responded; and the company rose. The party returned to town by special train shortly afterwards.

Each visitor was presented with a pamphlet furnishing an account of the origin of the scheme, and giving a description of the works, accompanied by a plan. We are compelled, owing to the pressure on our space, to hold over till next week a notice of the works; but an article dealing with the history of the scheme appears elsewhere. It may be mentioned here, however, that the works have been designed and are being carried out for the Joint Committee by Messrs. Walter Hunter and Reginald E. Middleton, MM.Inst.C.E.; and that the general contract, as already notified, has been entrusted to Messrs. John Aird and Sons. Messrs. J. Simpson and Co., Limited, will supply the pumping-engines; and Messrs. T. Piggott and Co., the steel pipes.

METROPOLITAN WATER SUPPLY COMMISSION.

Nineteenth Day—Monday, April 25.

(*Viscount* LLANDAFF, *Chairman*, *Sir* JOHN E. DORINGTON, Bart., M.P., *Major-General* A. DE COURCY SCOTT, R.E., *Rt. Hon.* J. W. MELLOR, Q.C., M.P., *Mr.* A. DE BOCK PORTER, C.B., *Mr.* H. W. CRIPPS, Q.C., *and Mr.* R. LEWIS.)

The sitting took place at the Westminster Town Hall.

The following Counsel are engaged: Mr. POPE, Q.C., and Mr. CLAUDE BAGGALLAY, Q.C., for the New River Company; Mr. LITTLER, Q.C., and Mr. LEWIS COWARD for the Kent Water Company; Mr. PEMBER, Q.C., for the Lambeth, East London, Grand Junction, and West Middlesex Water Companies; Mr. RICKARDS for the Chelsea Water Company; Lord R. CECIL for the Hertfordshire County Council; Sir JOSEPH LEESE, Q.C., M.P., for the Kent County Council and Kent Local Authorities; Mr. BALFOUR BROWNE, Q.C., and Mr. FREEMAN, Q.C., for the London County Council; Sir R. NICHOLSON for the Middlesex County Council; and Mr. GABRIEL P. GOLDNEY (Remembrancer) for the Corporation of the City of London. The Southwark and Vauxhall Water Company are represented by Messrs. BIRCHAM AND CO.

Mr. *G. P. Goldney*, the City Remembrancer, who was under cross-examination when the Committee last adjourned, handed in a table giving particulars of the investments made by the City Chamberlain of the instalments paid to him by the Companies now within the operation of the sinking fund clauses, from which it appeared that he held some £9000 worth of stock, which had been purchased for about £22,000.

In answer to Mr. BAGGALLAY, witness said the investments were made in the name of the Chamberlain thus: "William James Richmond Cotton, Chamberlain of London." He was then questioned as to the legal position of the Chamberlain in regard to these investments, whether he held as a trustee, whether the stock would pass automatically from him to his successor in office, what would happen if the Chamberlain became bankrupt, &c.; but he could give little information on the points. With regard to the present basis of charging by the Companies—namely, upon annual value—he did not know that it was put upon the Companies by Parliament, and not sought by them. It was a fact that it had been suggested that it would be an advantage if the Chamberlain had power to invest the contributions in stocks of Companies other than those making the contributions.

Mr. BAGGALLAY: The advantage, I take it, is that it would prevent the person making the investment being sometimes cornered in the market, and having difficulty, except at high prices, in finding stocks of the particular Company?

Witness: Yes; the possibility of this happening in the future.

On the other hand, if it were made general, would it not be made possible for the Chamberlain to invest entirely in the funds of one Water Company, and so get control of one undertaking and use it to the detriment of the others?—I think that was an argument put forward by one of the Companies.

And Parliament, having considered the two arguments, decided it was right that the Companies should not be put in the position of having one undertaking bought up which could be used to the detriment of the others?—At all events, the suggestion was acceded to; I do not remember the exact details.

In further cross-examination, witness said he understood the Auditor had found difficulty in drawing the line in the Company's accounts as to what should be attributed to capital and what to revenue expenditure. The Auditor could only make remarks upon these things, and had not sufficient power of enforcing them.

Mr. BAGGALLAY: You know that if he finds the accounts incorrect in principle or in detail, he can require the Company to correct them in such manner as he thinks right? What larger power can you suggest?

Witness: Well, the Auditor had not sufficient power.

You yourself are not prepared to suggest what alteration in his powers would meet what you think necessary?—No.

Do I understand there had never been any application by the City to purchase either the New River Company or any other Water Company?—Speaking from recollection, I think not—certainly not in recent years.

So far as the New River Company are concerned, I understand the only negotiations were of a strictly private nature?—Yes; perhaps they were hardly negotiations. They were conversations of a personal character—"feelers."

Apart from applications to Parliament, have the City ever suggested that if there were to be a purchase it should be a purchase otherwise than under the Lands Clauses Act in the ordinary way?—Yes; I think they have. They have always recognized the difficulty about the arbitrator or Court of Arbitration. They have suggested procedure under the Lands Clauses Act in the ordinary way; but I think they have always contemplated that, in dealing with so large a question, a special Court would be necessary.

Mr. MELLOR: And special conditions?

Witness: They have never suggested any special conditions of arbitration; and they have stated in general terms on many occasions that special conditions which were calculated unfairly to reduce the value of the undertakings of the Water Companies could not be expected from Parliament. There is a difference between assessing the value of a thing, and assessing the compensation to be paid for taking away that which a person wishes to keep.

You do not expect to get special arbitration terms?—Having regard to what took place before Mr. Plunkett's Committee, we know that there are certain special terms that have been granted. Therefore I do not accept that they will never be granted again. The Corporation have never expected to get the Water Companies for any other than fair terms; they have never expected that Parliament would put a reduced value upon the undertakings. I do not think the Corporation ever contemplated that they or the public generally would have to pay a large sum (like 10 per cent.) for compulsory purchase.

With regard to this matter of control. Do you think it a right thing that the control of a vendor should be in the hands of the purchaser—of the customer?—The Corporation have always looked upon these Water Companies as undertakings which should be dealt with on some other footing than that of mere mercantile concerns.

That is not quite an answer to the question whether you think the customer should control the purveyor?—It depends very much on what the article is. With a great many articles, that is the law at present.

The CHAIRMAN: What article?

Witness: Say, gas.

Mr. BAGGALLAY: There there is a sort of partnership under the sliding-scale.

Witness: A certain amount of control, too.

In answer to further questions, witness said he had never considered the question of amalgamating the New River and East London Companies, and of amalgamating their capitals, beyond thinking it would be a desirable thing, if it could be carried out. There would, he admitted, be great difficulties.

Mr. PEMBER: Would you suggest that, under the guise of control, any powers should be put into effect against the Companies which would result in reducing the value if purchase was in the air afterwards?

Witness: The Corporation have never contemplated using control for the purpose of knocking down the value of the Companies' shares. That would probably be unfair and unjust.

And you would not think it fair still to keep alive the agitation for purchase, so as to buy out the Companies at a reduced value afterwards?—I think the Corporation, like any other public body, would use their powers fairly and properly, and not in the way you suggest. If purchase is to take place under the Lands Clauses Act, the Corporation have come to the conclusion that financially it would be inexpedient.

That is because you find "compensation" not "value" is the word used in the Lands Clauses Act?—That is one of the reasons. Purchase under the Act would result in such a large figure, that the price of water in the City would inevitably have to be increased.

That, I take it, is in consequence of the fact that under the Lands

Clauses Act you would have to pay what is involved in the word "compensation?"—Partly that; but largely owing to the charge that would inevitably have to be made afterwards—the increase, the levelling up.

Compensation involves not only the absolute money value of the thing purchased, but anything else which the owner might lose by handing the property over to the purchaser?—My own impression is that that is what is included in the 10 per cent.

Does not "compensation" mean value to the owner from every point of view?—I think it means something more—compensation for being forced to do what he does not wish to do.

By Sir J. E. Dorington: In case of purchase by a public authority at a proper price, the people in the City would be unwilling to pay in proportion to their rates, because that would result in the water charges increasing largely. The City had always said that the basis of future charge should be considered before any definite line was adopted. A price perfectly fair to the Water Companies might be such as would not warrant purchase in the interests of the City.

Sir *Arthur Arnold*, the next witness, in reply to the Chairman, said he was an Alderman of the London County Council, of which he had been a member since its inception, and Chairman for two years. In 1896, he was appointed to negotiate with the Water Companies for the purchase of their undertakings. He met the Chairmen of all the Companies; but the negotiations, so far as what the Chairmen said to him, were confidential. He reported on March 24, 1896, to the Council: "I have met with no material discouragement. In the event of the necessary Act of Parliament being passed authorizing a transfer by agreement or by arbitration, I should even hope to find a disposition on the part of at least some of the Companies to treat on so sound and reasonable a basis that, without resort to arbitration, agreements could be arranged such as might be recommended to the Council for acceptance. I believe that these proceedings have led to a better understanding between the Council and the Water Companies; and that, by the majority of the gentlemen who direct with much ability and devotion the business of these Companies, the policy of purchase and transfer is accepted as the most satisfactory, and, indeed, the inevitable settlement of this important and difficult question." Subsequently he made a further report to the Council on the subject. It was not possible to arrive at a conclusion until the Bills then before Parliament were passed. Moreover, some of the Companies would not come to an agreement, owing to the overlapping of districts, &c., unless other Companies were similarly treated. Witness was closely questioned as to the precise stage the negotiations reached, and as to the grounds for his report; but he declined to enter into particulars. If the necessary Act of Parliament had been passed, he entertained a strong belief that, with some of the Companies at least, agreement might have been arrived at. He would not say terms had been settled, nor a figure, nor a basis on which to arrive at a figure.

The Chairman: Do I understand your report rightly that the majority of the Companies thought the policy of purchase satisfactory?

Witness: I gathered that from my conversations. I do not think there is unwillingness to submit to purchase on fair terms.

As I understand, Mr. Plunket's Committee had reported when you were negotiating with the Chairmen?—That is so.

Did you convey to the Chairmen your impression that arbitration under the Lands Clauses Act was gone as a result?—Certainly.

And that was accepted by them?—I am not in a position to state anything that was said to me by them.

But you met with no material discouragement?—So I have said.

Witness was pressed to give details of the interviews; but although Mr. Pember, representing for the time being at least seven of the Companies, gave him permission to speak freely of what passed, he steadfastly declined, on the ground that the conversations were confidential.

The Chairman: You went into these negotiations without any instructions as to what terms you could offer or accept?

Witness: That is so.

It seems a curious position to negotiate in. You did not know what to ask or what to concede?—Such, however, was my position.

As a man of business, I should like to know what was the use of this conversation, in which nothing was suggested, nothing proposed, nothing accepted, and nothing settled?—It produced in the mind of the unworthy person who was then Chairman of the Council an impression that, if the Act of Parliament had been passed, there would have been no substantial difficulty in coming to an agreement as to price of purchase.

Witness then proceeded to refer to the statements made earlier in the evidence, that the County Council were essentially a partizan and political body. He was examined at length on this subject. He gave a general denial to the allegations; averring that it was certainly incorrect to say that the Council had a tendency to decide municipal questions on political lines. Passing on, he expressed himself as being in favour of purchase by the London County Council, as that would add to the purity of the water supply, and consequently benefit the public health.

The Chairman: Are you of opinion that the Council, having purchased, should be free from all control?

Witness: I do not see that that follows as a matter of necessity. If there is any statute in existence by which the Local Government Board has control over municipal authorities, I see no objection to it. Speaking only for myself, I should rather like control, even over the County Council, so as to make assurance doubly sure.

Have you at all considered whether the present system of control is sufficient and satisfactory to secure purity in the water supply?—Yes; and I think it is not sufficient. I cannot conceive of any control that would be sufficient to ensure purity of the water supply of London, except that of consumers and of the representatives of the consumers. As to control by the County Council, I am now of opinion that it is unnecessary, and that they, being the representatives of the people, may be trusted.

Then you would leave it absolutely to the County Council to supply pure water, according to their judgment and their lights?—It think that would be sufficient.

If a consumer thought the water turbid or impure, you would leave him no remedy but complaint to the Council?—It would be sufficient.

On what do you base your opinion that the purity of the water supply would be advanced by purchase?—Because the interest of the consumer is the greatest of all interests; and that interest, which is not, and cannot, now be represented, would be represented.

Have you considered the financial aspect of purchase?—Generally speaking, it seems to me that, given the fact that the credit of the Council is at least ¼ per cent. better than that of the Companies, and that there would be unity of management, I think if the water undertakings were bought on a fair basis there would be no reason to suppose that purchase would be unprofitable.

It being pointed out that the Council had agreed to sever portions of the Companies' undertakings according to the necessities of the areas outside London, and that this would do away with unity, witness alluded to the case of Manchester, which afforded an instance of the unity he meant. By fair basis or price, he meant such a price as would be fixed by a full, free, fair, and open arbitration – absolutely open.

The Chairman: Do you mean by that an arbitration under the Lands Clauses Act?

Witness: No; I do not.

What is the difference between your arbitration and one under the Lands Clauses Act?—It seems to me that the arbitrator would be bound by technical rules under the Lands Clauses Act, which would not apply in the other case.

Mr. Cripps: Would you give one of them?

Witness: It appears to me that this is so complicated, so difficult a matter, that, without reserving anything, it would be much better to refer it to the arbitrator as I have suggested.

The Chairman: But what technical rule prevents an arbitrator doing that under the Lands Clauses Act?

Witness: There have been cases where the Lands Clauses Act has not been used; and those cases have been like this—where the circumstances are special. I want to make this case special.

Mr. Cripps: What is it in the Act of Parliament to which you object?

Witness: I object that I think it undesirable to have a specific claim for compensation; that a specific amount should be fixed.

What is there specifically in this case to make the Lands Clauses Act unfairly apply to it?—The various obligations of the Companies.

But the arbitrator is entitled to take every one of those into his full consideration?—Then I felt great weight was due to Mr. Plunket's Committee, who, in their resolution, set aside the Lands Clauses Act. Their decision pointed to an arbitration different from one under the Lands Clauses Act.

That is to say, you proposed a special clause, and that clause was considered by the Committee?—Yes. If the Committee had given another day to considering the clause, I think they would have decided to exclude the Lands Clauses Act.

The Chairman: You think the arbitrator ought to take into consideration whether the powers of the Companies had been fairly or unfairly exercised?

Witness: Yes: I think so.

Therefore, if he thinks they have used their powers unfairly, he ought to give them less?—Supposing they have used power which has unjustly brought profit to them, he ought not to give them the advantage of such profit.

On the other hand, you know quite well that those powers are of statutory authority?—Yes.

Do you mean that the arbitrator is to take into account the mode of exercise of a legal power of the Company?—I should think not.

The Committee then adjourned till yesterday, May 2.

The twentieth sitting of the Commission was held yesterday—Lord Llandaff presiding, and all the Commissioners being present. Sir Arthur Arnold gave further evidence with regard to reasons, previously laid before the Commission, why the London County Council was not a proper body to administer the water supply. As to the allegation that the Council was overworked, he stated distinctly that this was untrue; that the work was not, and practically never had been, in arrear; and, indeed that the Council had never been able to find places enough on the various Committees for the members who desired to serve on them—this being one reason why the Committees were so unduly large. He also denied that the Council was of a political and partisan character.

IPSWICH CORPORATION WATER DEPARTMENT.

Annual Report.

The Ipswich Town Council last Wednesday had under consideration the report of the Water Committee for the year ending March 25 last. It pointed out that the rebate of 10 per cent. allowed to all consumers other than for trade purposes, pursuant to the resolution of the Council passed on May 12, 1897, had absorbed £973, and that this, with a slight increase in the ordinary expenditure, left a debit balance of £205 on the revenue account for the year. After making good this debit balance out of the amount brought forward from the preceding year, the Committee carried forward a balance of £3149. Having regard, the report continued, to the increased sum which the Committee would have to pay for the general district rate in the current year, by reason of their mains being rated at the full amount of assessment, instead of at one-fourth as had hitherto been the case, and to the increased amount which they would have to pay for interest and instalment of sinking fund in respect to their further loans on capital account, they regretted that they were unable to recommend a continuance of the 10 per cent. rebate for the current year. It was also stated that nearly all the capital borrowed under the provisions of the Corporation Water Act of 1892 had been expended, and that it would be necessary to borrow £3200 more for purposes mainly connected with the distribution system. In moving the adoption of the report, Mr. H. J. W. Jervis stated that the total rental for the year was £13,277, as against £12,974 last year—an increase of £303. On the other hand, there had been a slight increase in the expenditure of £277—£4257, as compared with £3980. As pointed out in the report, this, with the rebate of 10 per cent. allowed to consumers other than consumers for trade purposes, left them with a debit balance of £205 on the revenue account. The expenditure on capital account had been proceeding, he was afraid, at rather a rapid rate. It amounted to £4570. But this was not so much as in the previous year, when they spent upwards of £6000; and he hoped that, although it was not spent entirely in remunerative work, it would lead to a decrease in the charges for pumping. The report was adopted.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The Edinburgh and Leith Gas Commissioners transacted a good deal of business on Monday. One of the Commissioners raised the question as to what, if any, attempt had been made to verify whether the oil which was supplied was of the quality contracted for; and, to gratify his inquiring disposition, it was agreed to have a sample of the oil analyzed. Bailie Kinloch Anderson, who presided, referred to the output of gas during the month of March, which, he said, exceeded that of March of last year by nearly 7½ million cubic feet. Considering that the electric light output during the same month was the largest on record, he thought their position was most satisfactory. The Committee in charge of the Bill for the new gas-works at Granton reported what they had done. Regarding it, the Chairman said they had had opposition in the House of Lords from two persons, who both petitioned against the Bill on the ground that the amenity and the value of their properties would be disturbed by gas-works being put down beside them. The Committee considered the matter, and could not see that they would be at all justified in admitting that in the immediate future there could possibly be any disturbance of the amenity of the residences in question. They knew that they would not reach the boundary of the new site so quickly as the petitioners anticipated. While they asked powers for the manufacture of gas in the whole of the area to be acquired, they did not intend to exercise the power right away; and they had stated in evidence that it would be a considerable number of years before their works would reach the western boundary of the site. Their belief was that before then the whole district would have altogether changed in character. The land adjoining the works was now laid out for feuing; and there was little doubt that before the gas-works reached the western boundary there would be a large number of workmen's houses, and perhaps public works, in the neighbourhood. The petitioners asked for compensation, or to be purchased right out; but the Committee, while not admitting that there would be any damage, agreed not to manufacture gas in the western part of the new site for ten years, and, further, that before they did begin its manufacture there, they would return to Parliament and apply for powers to do so. These powers, they had no doubt, would be granted. The result of restricting their demands in the Bill was that the Lords' Committee passed it without making any conditions as to the payment of compensation to anyone. What they had done had apparently satisfied their opponents; for they had not lodged petitions against the Bill in the Lower House. The Bill would, therefore, pass the House of Commons as an unopposed measure. They would be before the Unopposed Bill Committee of the House towards the end of the week; and they expected to receive the Royal Assent to the Bill in about a month. They were losing no time in preparing for the new works. Mr. Herring, their Engineer, was in the meantime having the ground surveyed, and was preparing plans as to the laying out of the works. He wanted, first of all, to proceed with the erection of a gasholder, so as to be ready by the time they had works erected. He (the Convener) wished to express his satisfaction with the success which had attended the efforts of the Committee, and the great pleasure they had in knowing that they were to be unopposed in the remainder of the procedure. The report of the Committee was adopted; and a formal vote of thanks was accorded to them for their services. I observe that the Bill passed the Committee of the House of Commons on Thursday.

The Chairman then intimated that it had been resolved that the old chimney at the Edinburgh works should now be removed. It is three years since it was condemned; and it is quite fifteen months since a new chimney was erected to take its place. But the new one unfortunately did not work as expected. A good deal of alteration has been made upon it. Mr. Herring, it was stated, is now satisfied that it is doing its work thoroughly, and that the old chimney may be taken down. The Commissioners authorized him to adjust specifications for the work.

Another item of business of considerable importance was authorizing the laying of a new gas-main from the Edinburgh works to Portobello, at a cost of about £7000. Since Portobello was amalgamated with Edinburgh, and the price of gas was reduced to the city figure, the demand for gas has grown enormously. Although the proposed capital expenditure was large, it was explained, the Commissioners would save £220 a year by this course, as compared with the manufacture of gas at the Portobello works. When the main is laid, those works will only be used during times of pressure. The new main, it was also said, will be an instalment of the distributing plant from the new works at Granton; and in this way there will be no disturbance of the supply when the new works are brought into use.

The Commissioners also remitted to the Finance Committee to consider as to the raising of money to meet the cost of the Granton works. It was stated that probably the Corporation of Edinburgh would be able to supply the Commissioners with the money they require.

Mr. Haldane, Writer to the Signet, who is interested in dwelling-houses belonging to the St. Giles' Dwelling-House Company, Limited, wrote to the Commissioners asking if they could not supply more than 20 cubic feet of gas for 1d. in prepayment meters. The Chairman stated that they originally gave 24 cubic feet for 1d.; but Mr. Herring found that they were losing money, and they reduced the quantity to 20 feet. The Commissioners agreed not to make any change in the present price.

As I have written before, one of the best-managed gas undertakings in Scotland is that belonging to the Corporation of Hamilton, of which Mr. W. Ewing is Manager. Mr. Ewing sells gas of 23-candle power at 2s. 1d. per 1000 cubic feet. When he entered upon his duties at Hamilton, seven years ago, the price was 4s. 2d. The effect of the great reduction in price has been to raise the consumption of gas from 60 to 100 million cubic feet. Conjointly with this great increase, Mr. Ewing has almost entirely reconstructed the gas-works; and, of course, considerable extensions have been required. These have been done at a very low outlay—many of the works having been paid for out of revenue, thereby saving the capital account. It has been Mr. Ewing's aim to develop as much as possible the demand for gas for cooking and heating. In this he has been so successful that he is in a fair way to afford the first practical illustration of the expectation which is so frequently given expression to, that the future of gas will, to a much larger extent than has hitherto been the case, depend upon cooking and heating than upon lighting. This

GAS AND WATER COMPANIES STOCK AND SHARE LIST.

Referred to on p. 994.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.
590,000	10	Apl. 15	10½	Alliance & Dublin 10 p. c.	23½—24½	..	4 5 9
100,000	10	,,	7½	Do. 7 p. c.	16—17	..	4 8 3
300,000	100	Jan. 3	5	Australian 5 p. c. Db. .	105—107	..	4 13 6
200,000	5	Nov. 11	6†	Bombay, Ltd. . . .	5⅝—6½	..	4 16 0
40,000	5	,,	6†	Do. New, £4 paid .	4½—5½	..	4 11 5
380,000	Stk.	Feb. 24	12	Brentford Consolidated	293—298	..	4 0 6
240,000	,,	,,	9	Do. New	223—228	..	3 18 11
50,000	,,	,,	5	Do. 5 p. c. Prf.. .	140—145	..	3 9 0
159,375	,,	Dec. 15	4	Do. 4 p. c. Db. Stk.	134—138	..	2 18 0
230,000	Stk.	Mar. 30	11½	Brighton & Hove Orig..	270—275	..	4 3 8
218,820	,,	,,	8½	Do. A. Ord. Stk. .	195—200	..	4 5 0
933,500	Stk.	Feb. 24	5	Bristol, 5 p. c. max. .	127—132	..	3 15 9
420,000	20	Ma . 30	11½	British	55—56	..	4 0 4
50,000	10	Mar. 11	11½	Bromley, Ord. 10 p. c. .	25—27	..	4 5 2
75,000	10	,,	8½	Do. 7 p. c. .	20—22	..	3 17 3
500,000	10	Apl. 29	6	Buenos Ayres (New) Ltd	8⅞—9⅛*	..	6 9 9
98,122	Stk.	Dec. 30	4	Do. 4 p. c. Db. Stk.	98—100	..	4 0 0
150,000	20	Mar. 11	8½	Cagliari, Ltd. . . .	30¾—31½	..	5 4 9
100,000	10	Sep. 30	8	Cape Town & Dis., Ltd.	16—17	..	4 14 2
50,000	50	Nov. 2	6	Do. 6 p. c. 1st Mort.	59—61	..	4 18 5
550,000	Stk.	Apl 15	13½	Commercial Old Stock .	323—338	—2	3 19 11
200,750	,,	,,	10½	Do. New do. . .	250—255	..	4 2 4
200,750	,,	Dec. 15	4½	Do. 4½ p. c. Db. dc.	150—155	..	2 18 1
800,000	Stk.	Dec. 15	12	Continental Union, Ltd.	215—225	..	5 6 8
200,000	,,	,,	9	Do. 7 p. c. Prf. .	200—210	..	4 5 9
51,600	Stk	Feb. 21	14	Croydon A 10 p. c. . .	310—315	..	4 8 11
168,400	,,	,,	11	Do. B 7 p. c. . .	255—265	..	4 3 0
535,000	Stk.	Feb. 24	5½	Crystal Palace Ord. 5 p. c.	128—133	..	3 18 11
60,000	,,	,,	5	Do. 5 p. c. Prf. .	142—145	..	3 9 0
486,090	10	Jan. 27	11	European, Ltd. . . .	23½—24½	..	4 9 9
354,060	10	,,	11	Do. £7 10s. paid .	17—18	..	4 11 9
5,922,110	Stk.	Feb. 10	12½	Gaslight & Coke, A, Ord.	280—285	—2	4 9 6
100,000	,,	,,	4	Do. B, 4 p. c max. .	118—123	..	3 5 1
665,000	,,	,,	10	Do. C, D, E, 10 p. c. Prf.	300—305	—5	3 5 7
30,000	,,	,,	5	Do. F, 5 p. c. Prf. .	150—155	..	3 4 6
60,000	,,	,,	7½	Do. G, 7½ p. c. do. .	220—225	..	3 6 8
1,300,000	,,	,,	7	Do. H, 7 p. c. max. .	195—200	..	3 10 0
463,000	,,	,,	10	Do. J, 10 p. c. Prf. .	300—305	—3	3 5 7
476,000	,,	,,	6	Do. K, 6 p. c. Prf. .	173—183	—6	3 5 7
1,061,150	,,	Dec. 15	4	Do. 4 p. c. Db. Stk. .	132—135	..	2 19 3
294,850	,,	,,	4½	Do. 4½ p. c. do. .	150—155	..	2 18 1
958,030	,,	,,	6	Do. 6 p. c. do. .	202—207	..	2 18 0
70,000	10	Oct. 28	8	Hongkong & China, Ltd.	14—15	..	5 6 8
3,800,000	Stk.	Nov. 11	10	Imperial Continental .	213—218	..	4 11 9
376,400	100	Feb. 1	4	Do. 4 p. c. Dbs. Red.	98—101	..	3 19 3
473,600	Stk.	Feb. 10	3½	Do. 3½ p. c. Db. Stk. ,,	103—106	..	3 6 0
550,000	100	Apl. 1	5	Met. of Mel- 5 p. c. Db.	110—112	..	4 9 3
250,000	100	,,	4½	bourne 4½ p. c. Db.	107—109	..	4 2 7

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.
75,000	5	Dec. 15	6	Malta & Medn., I td. .	5½—6	..	5 0 0
541,920	20	Nov. 11	5	Monte Video, Ltd. . .	15—16	..	6 5 0
617,946	Stk.	Feb. 24	9½	Newc'tle & Gatesh'd Con.	235—240	..	4 1 3
252,325	Stk.	Jan. 3	8½	Do. 8½ p. c. Db. Stk.	115—120	..	2 18 4
150,000	5	Nov. 26	8	Oriental, Ltd. . . .	8—8½	..	4 14 2
135,000	5	,,	8	Do. New, £4 10s. pd.	7—7½	..	4 16 0
15,000	5	,,	8	Do. do. 1879, £1 pd.	1½—2	..	4 0 0
60,000	5	Mar. 11	7	Ottoman, Ltd. . . .	4⅜—5	..	7 0 0
420,000	100	Nov. 2	6	People's Gas 1st M. Bd.	104—109	..	5 10 1
500,000	100	Dec. 1	6	of Chicago 2nd do.	103—108	..	5 11 1
848,070	10	—	—	River Plate Ord.. . .	9⅛—9⅜	..	—
250,000	Stk.	Jan. 27	4	Do. 4 p. c. Db. Stk.	99—101	..	3 19 3
250,000	10	Apl. 29	10	San Paulo, Ltd. . . .	15½—16½*	..	6 1 3
135,000	Stk.	Mar. 30	10	Sheffield A.	24⅝—248	..	4 0 8
209,053	,,	,,	10	Do. B.	245—248	..	4 0 8
447,427	,,	,,	10	Do. C.	245—248	..	4 0 8
5,531,250	Stk.	Feb. 24	5½	South Metrop., 4 p.c Ord	132—135	..	3 17 9
1,460,000	,,	Jan. 13	3	Do. 3 p. c. Db. Stk.	103—106	..	2 16 7
60,000	Stk.	Mar. 11	12	Tottenham and A. .	285—295	..	4 1 4
60,000	,,	,,	10	Edmonton B. .	205—215	..	4 3 9
182,380	10	Dec. 20	7	Tuscan, Ltd.	13—14	..	5 0 0
149,900	10	Jan. 3	5	Do. 5 p. c. Dbs. Red. .	100—103	..	4 17 1
				WATER COMPANIES.			
746,164	Stk.	Dec. 30	10½	Chelsea, Ord.	320—330	..	3 3 8
150,000	,,	,,	5	Do. 5 p. c. Prf. . . .	177—180	..	2 15 6
160,000	,,	,,	4½	Do. 4½ p.c. Pf. Stk., 1875	157—160	..	2 16 3
175,785	,,	Mar. 30	4½	Do. 4½ p. c. 1 b. Stk. .	158—163	..	2 15 3
1,720,560	Stk.	Apl. 15	8	East London, Ord. . .	223—228	..	3 10 2
654,740	,,	Dec. 30	4½	Do. 4½ p. c. Db. Stk.	158—162	..	2 15 7
390,000	,,	,,	3	Do. 3 p. c. Db. Stk..	105—107	..	2 16 1
700,000	50	Dec. 15	7½	G'd Junct'n, 10 p. c. max.	115—120	..	3 2 6
310,000	Stk.	Mar. 30	4	Do. 4 p. c. Db. Stk.	140—145	—3	2 15 2
708,000	Stk.	Feb. 10	13	Kent	358—363	..	3 11 8
160,000	,,	,,	7	Do. New, 7 p. c. max..	215—218	..	3 4 3
1,043,800	100	Dec. 30	10	Lambeth, 10 p. c. max. .	295—300	..	3 6 8
406,200	100	,,	7½	Do. 7½ p. c. max. .	228—233	..	3 4 4
350,000	Stk.	Mar. 30	4	Do. 4 p. c. Db. Stk.	140—145	..	2 15 2
500,000	100	Feb. 10	13	New River, New Shares	440—445	..	2 18 5
1,000,000	Stk.	Jan. 27	4	Do. 4 p. c. Db. Stk.	142—147	..	2 14 5
902,300	Stk.	Dec. 15	6	Southw'k & V'xhall, Ord.	155—160	..	3 15 0
126,500	100	,,	6	Do. do. 7½ p. c. max. .	152—157	..	3 16 5
489,200	Stk.	,,	5	Do. do. 5 p. c. Prf. .	174—179	..	2 15 10
1,019,585	,,	Apl. 15	4	Do. 4 p. c. A Db. Stk.	140—145	—2	2 15 2
1,155,066	Stk.	Dec. 15	10	West Middlesex . . .	300—305	..	3 5 7
200,000	,,	,,	4½	Do. 4½ p. c. Db. Stk.	160—165	..	2 14 7
200,000	,,	Mar. 11	3	Do. 3 p. c. Db. Stk.	105—107	..	2 16 1

* Ex div.

† Next dividend will be at this rate.

week he has had an exceedingly successful exhibition of gas appliances in the Town Hall; the exhibitors being the Cannon Hollow-Ware Company, Limited, and Messrs. Richmond and Co., Limited (of London, Stratford, and Warrington). In connection with this useful exhibition, Messrs. Richmond on Wednesday evening entertained the members of the Town Council and a large number of gas managers to a banquet. The viands for a company of 60 persons were cooked in the exhibition by Mrs. Young, of Glasgow, and her daughter—four cookers being used in the process. Mr. E. W. T. Richmond occupied the chair, and proposed the toast of "The Corporation and Gas Department of Hamilton," which was responded to by Provost Keith, Bailie MacHale (who is Convener of the Gas Committee), and Mr. Ewing. Treasurer Keith proposed the toast of "The Visitors and the Gas Industry," which was responded to by Mr. Napier Myers, of Saltcoats, Mr. A. Bell, sen., of Dalkeith, and Mr. A. MacPherson, of Kirkcaldy. The proceedings were most entertaining, and will probably be productive of much good, in the way of opening the eyes of the Corporation and of the community to the fact of the excellence of the Gas Department in the town. It is said that this is the first occasion upon which so large a banquet has been attempted in connection with a gas exhibition. Whether this be so or not, there can be no doubt that the entertainment exhibits the enterprising nature of the business conducted by Messrs. Richmond and Co. The preparation of the banquet also reflects the highest credit on the gifted lady who lectured during the week.

The Dundee Town Council held a special meeting on Thursday, at which they fixed their coal contracts for the gas-works for next year. They have secured 55,000 tons; but they have not been able to escape the rise in the price of coal. The advance is, on an average, 7½d. per ton over the price paid for the current year's supplies. Even with this rise, it is expected that, on account of the very favourable results which have been obtained in the year's working, it will not be necessary to advance the price of gas.

There have been a number of explosions of gas of late, due, as is nearly always the case, to carelessness in the use of gas or in searching for escapes. The most serious of these of which I have learned, and also the most distressing, was one which occurred in a dwelling-house in Aberdeen on Sunday last. In this case an infant child of two years old, in its nurse's arms, had one of its arms injured by a door being blown against it; and it was necessary to amputate the arm. Damage to the amount of about £250 was done in the house. The cause of the escape was the want of water in a gaselier.

The electric light has at last succeeded in supplanting gas, in one place. This interesting event has occurred at Fort William, where there is a population of less than 2000. There is no occasion as yet, therefore, for panic, among holders of gas shares. There was a local Gas Company, but it was not successful; and when electricity was introduced by a Company who generate it by water power among the adjoining hills, the sale of gas fell off. The undertaking of the Gas Company was acquired by Mr. Hugh Mayberry, of Glasgow. He purposed reconstructing the gas-works, which were among the oldest in Scotland, and were worn out; and with this intention he acquired a site for new works. He has, however, found it to be more profitable to dispose of his whole property to the West Highland Railway Company. The works have therefore been closed. For the fixing of the price which the Railway Company are to pay for the works, Sheriff Lees, of Stirlingshire, has been nominated by both parties. He has had experience in the work of fixing the value of a gas undertaking, having been the Referee in the abortive Stirling gas arbitration of last year.

There was a long discussion as to the raising of the charge for gas supplied to lights on common stairs in Edinburgh from 15s. 9d. to 18s. 11d. a year. The charge in Leith is 17s. 5d. per lamp per year. The reason for the higher charge in Edinburgh is that the lamps are kept burning, it is calculated, about an hour and a half longer each night than they are in Leith. The rate works out at about 2s. 5d. per 1000 cubic feet of gas consumed. The increase will entail an extra charge upon the Edinburgh Corporation of £1224 a year. The increase was approved.

It was explained that a workman had died from the effects of a burning accident, and that, although, in the present state of the law, the Commissioners were not liable for the accident, they considered that, under the Workmen's Compensation Act, which comes into force in July, they would have been liable; and, seeing that they were just on the verge of the Act coming into force, they resolved to pay the workman's widow £150 as compensation, which was about the maximum sum she would have been able to recover under the Act. This generous proposal met with general approval. In connection with the same subject, the Commissioners remitted to the Finance Committee to formulate a scheme for insurance against liability under the Act. This could be done, the Chairman said, in more ways than one; and they preferred to institute a fund of their own, to insuring with any of the companies who had been offering them terms.

The New Water-Works for Bedworth.—The Local Government Board have sanctioned a loan of £1300 for carrying out new water-works for Bedworth.

The New Reservoir of the Plymouth Corporation.—In the article last week (p. 958) on the progress of the Burrator reservoir of the Plymouth Corporation, it should have been stated that the works were designed by the Borough Water Engineer, Mr. E. Sandeman, M.Inst.C.E., and that they received the approval of Mr. J. Mansergh, M.Inst.C.E., who was subsequently consulted. They are being carried out by these gentlemen jointly.

Collapse of the Electric Light in Dublin.—The following paragraph appeared in the "Daily Nation" last Thursday: "Many of the visitors to the city for the Punchestown Races had an unpleasant experience of the defects of the Corporation electrical lighting system last night, when at least two of the most important hotels, which were filled with guests, were left in complete darkness through the collapse of the electric current. The result naturally was the production of much inconvenience and annoyance; and it is to be feared that many strangers will carry away with them no very flattering idea of Irish methods of municipal administration. The incident attests in the most conclusive way how near complete breakdown the existing system of electric lighting is." Our Dublin contemporary characterizes the accident as a "scandalous collapse."

R. & A. MAIN, Ltd.

Argyle Works, GLASGOW.

Telegrams: "GASMAIN, GLASGOW."

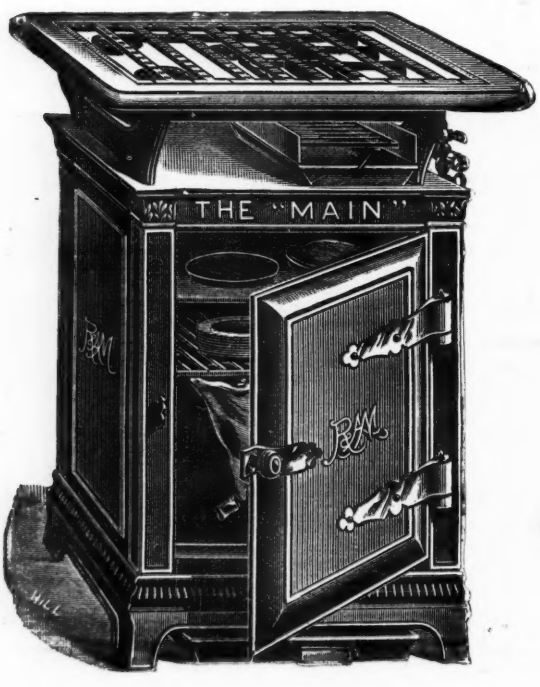
109, Farringdon Road, LONDON, E.C.

Telegrams: "GASMAIN, LONDON."

BRISTOL:
28, BATH STREET.
Telegraphic Address: "GOTHIC."

BIRMINGHAM:
1, OOZELLS STREET.
Telegraphic Address: "GOTHIC."

MANCHESTER:
37, BLACKFRIARS STREET.
Telegraphic Address: "GOTHIC."



THE

"MAIN" COOKER

With removable Enamelled Fittings.

Inside Linings can be had Enamelled in a variety of shades.

WRITE FOR OUR NEW SEASON'S LIST.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *April* 30.

Sulphate of Ammonia.—In the closing days of the month, there has been more business doing for immediate delivery; and in England last week's prices have been maintained. In Scotland, however, where supplies are fairly abundant, and immediate shipping facilities have been wanting, there has been some decline in values, notwithstanding increased home demand. The closing quotations are £8 12s. 6d. per ton f.o.b. Leith and Hull, and £8 16s. 3d. per ton f.o.b. Liverpool. There has been renewed demand for Spain (disturbed by threatened war with the United States, and its subsequent outbreak), and business is resuming its usual course. Home demand in England is easing off somewhat. For May delivery, speculative quotations are about 2s. 6d. per ton under those for spot and early delivery. It is reported that business has been done in Scotland over the early autumn months at £8 10s. per ton f.o.b. Leith.

Nitrate of Soda is rather firmer on spot; and the quotation for fine quality is 7s. 6d. per cwt.

LONDON, *April* 30.

Tar Products.—A dull uninteresting market continues to exist. Deliveries of products both to home and foreign markets are large; but these are almost entirely on old contracts entered into some time ago. The severe depression which has taken hold of benzol shows no signs of relief, notwithstanding the quantities that are now going into consumption for gas enrichment purposes. Dealers are quoting anthracene at lower rates; but no business of importance has transpired at anything under the quotations mentioned below. Carbolic acid is firm, with a good deal of inquiry for forward delivery; and notwithstanding the great collapse in the value of tar products, it does not look as if the season will close with increased stocks in makers' hands.

The following general quotations are made: Tar, 10s. to 13s. 6d. Pitch, 20s. east coast; 16s. to 17s. west coast. Benzols, 90's, 10d.; 50's, 11d. Toluol, 1s. 2½d. Solvent naphtha, 1s. 3d. Heavy naphthas, 1s. 1½d. Crude, 30 per cent., naphtha, 4½d. Creosote, 2½d. Heavy oils, 45s. to 50s. Carbolic acid, 60's, 2s. 1d. Naphthalene, 50s. to 60s. Salts, 35s. Anthracene, "A," 5d.; "B," 4d.

Sulphate of Ammonia.—A somewhat desultory market during the week leaves prices very much as they were. Stocks are low in makers' hands, and home consumption is brisker than it has ever been before; while a good deal of inquiry for forward delivery comes from numerous foreign sources. Taking these points together, the position is not weaker, notwithstanding the efforts of dealers who offer less money than the recognized market quotation, which is £8 7s. 6d. to £8 10s., less 3½ per cent., according to port.

The Water Supply at Port Erin, Isle of Man.—The Commissioners of Port Erin and Port St. Mary are trying to get the water supply in their own hands. Some time ago an offer of £10,000 was made to the Rushen Water Company for their works; but this was refused. It is now stated that £12,000 has been offered for the concern.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—Though for the time being there is a quietening down in the demand, both on inland requirements for the better qualities of round coal and in the recent pressure of shipping orders, with a tendency to ease somewhat on current prices—at any rate, so far as the advanced rates which have recently been got or were being quoted, are concerned—the outlook as regards contracts over the ensuing twelve months points unmistakably in the direction of higher prices ruling than those which were obtainable last year. Not only has the increased demand for shipment which has been thrown upon this district owing to the South Wales dispute, cleared away a very considerable quantity of stock, which would otherwise have had its effect in keeping down prices, but the wages question is now coming to the front, in a way that makes it practically certain the Miners' Federation of Great Britain will, with the ensuing autumn, if not at an earlier period, demand a return of the 10 per cent. reduction in wages, which a couple of years back was submitted to. The wages question has already been pretty freely discussed in the coal trade; and many of the leading colliery owners have expressed a determination to resist any such demand. But whether there will be sufficient unanimity among the coalowners in Lancashire, Yorkshire, and other parts of the Federation districts to successfully resist, is perhaps doubtful. In any event, the now practical certainty of a wages agitation, following upon the pretty considerable depletion of stocks during the past month, cannot but very materially affect prices. In fact, representatives of some Lancashire collieries have already been discussing the question of holding out for advances of 6d. to 1s. per ton on last year's contract prices for gas coal, locomotive fuel, and steam coal for shipment. So far, the contracts which have come forward are not of sufficient importance to afford any really reliable basis as to how prices are likely to rule; but there is no doubt whatever that colliery owners will hold out for advances upon last year's rates. In the better qualities of round coal there has been a decided falling off in demand during the past week or so. Prices are not more than maintained at 10s. to 10s. 6d. per ton for best Wigan Arley; 8s. 6d. to 9s. for Pemberton four-feet and seconds Arley; and 7s. to 7s. 6d. for common house-fire qualities. Steam and forge coals still move off readily, as surplus supplies of these continue to be in active request for shipment. Ordinary qualities are about 7s. per ton at the pit; with good sorts of steam coal for shipment at the ports on the Mersey fetching from 10s. 6d. to 11s. 6d. Engine classes of fuel are rather more plentiful, owing to the large quantity of coal recently screened out of stock; the slack taken out being offered in the market in some cases at lower figures. But fresh-got slack remains generally steady at late rates—averaging 3s. 3d. to 3s. 6d. per ton for common, 3s. 9d. to 4s. 3d. for medium, and 4s. 6d. to 5s. for the better qualities, with a tendency to harden for forward contracts.

Northern Coal Trade.—There has been continued activity in the coal trade of the North-east; the additional demand diverted from South Wales having now the accompaniment of the beginning of the Baltic season. The increased business demand is more in steam and bunker

JOSEPH AIRD
GREAT-BRIDGE,
STAFFORDSHIRE.
HIGHEST QUALITY
TUBES AND FITTINGS
GAS, STEAM, WATER, GALVANIZED TUBES and FITTINGS in all Sizes.
LARGE TUBES FOR COLLIERIES.
Illustrated Price Lists on Application.
LONDON OFFICES: 46, QUEEN VICTORIA STREET, E.C.

coals; but there is also additional inquiry for gas coals. Practically, therefore, the whole of the collieries in the North are fully at work; and there is pressure for early supplies, while the range of prices is higher all round. Best Northumbrian steam coals are steady at about 15s. per ton f.o.b.; second qualities are about 13s.; and steam smalls, about 5s. There is a strong demand, and the range of prices is from 9s. to 9s. 6d. per ton f.o.b. Gas coals are very steady; the deliveries being about normal on contract. There are, however, also sales of some occasional lots for pressing need to towns which do not usually draw supplies from this part; and for these the price varies from about 9s. to 10s. per ton f.o.b. One or two additional contracts are in the market. There is very little alteration in the demand for manufacturing coals; and prices are without much change. Prices of gas coke are unaltered this week.

Scotch Coal Trade.—Tranquillity has been restored in the Scotch mining world, except in Fifeshire, by the granting of advances in wages. There is consequently a large output; and business, which was slightly interrupted by the men taking idle days, is likely to be brisk. Prices have not advanced during the past week, and may be given as: Main, 9s. per ton f.o.b. Glasgow; ell, 10s. 3d. to 10s. 9d.; and splint, 9s. to 9s. 6d. The shipments for the week amounted to 205,701 tons—a decrease on the preceding week of 7174 tons, but an increase over the corresponding week of last year of 27,241 tons. For the year to date, the total shipments have been 2,282,950 tons—an increase over the same period of last year of 153,971 tons.

The Supply of Water Gas at Birkenhead.—The Special Sub-Committee of the Birkenhead Town Council, appointed, in consequence of a ratepayers' petition, to consider the subject of the manufacture and supply of carburetted water-gas, report that since the introduction of the gas the ordinary complaints from consumers have decreased remarkably; the number received last year being only 1539, whereas in 1896 it was 3914. The Sub-Committee add that if the mixture of coal and water gas be distributed with the same care and attention to pipes and fittings as has been given in the past, there can be no reasonable or valid objection to the supply of the mixed gases.

Incandescent Gas Lighting at Penzance.—A report by the Borough Surveyor (Mr. G. H. Small) on the consumption of gas in the public lamps in the year ended March last, was presented to the Penzance Town Council last Tuesday. It showed a reduction of consumption in the short-hour lamps in favour of incandescent burners of 933 cubic feet of gas, and in the long-hour lamps in favour of the incandescent burners of 861 cubic feet, or a money saving in the year of 3s. 5d. for each short-hour incandescent lamp, and of 3s. 1·8d. for each long-hour incandescent lamp. In reply to a question, Mr. J. Trenwith, the Chairman of the Lighting Committee, said this did not include the cost of mantles or fittings. Mr. G. Poole suggested that they had saved 3s. on gas and spent 7s. on mantles. Mr. Trenwith said they had saved 3s. 6d. on gas and it cost them about 7s. 6d. for mantles and other things; but they would not require so heavy an expenditure every year. The Mayor (Mr. W. H. Julyan) said they had a better light, and had paid no more for it.

Gas Profits at Wigan.—The Chairman of the Gas and Electric Lighting Committee of the Wigan Corporation (Mr. C. B. Holmes) informed his colleagues last Wednesday that the gross profit on the undertaking for the year ending March 31 last was £24,577; the net profit being £11,281. It was resolved that £10,300 be handed over in aid of the general district rate, and that the price of gas to consumers within a mile radius from the gas-works be reduced from 3s. 1d. to 3s. per 1000 cubic feet.

A Water Diviner Successful.—In view of the report which appeared in the "JOURNAL" last Tuesday week of the decision of the Local Government Board Auditor (Mr. Casson) to surcharge the fees paid to Mr. Leicester Gataker, a water diviner, by the Ampthill District Council, it may be of interest to record the following case given in the "Midland Counties Herald," in which his divination was correct. A Bedfordshire gentleman, Mr. Plater, wanted water for his house and stables. He therefore engaged a firm to sink a well 60 feet deep; this being the depth at which it was expected water would be met with. But none was found. Sinking was continued to 100 feet deep; but still without success. A bore was then put down at the bottom of this well a further 66 feet, making a total depth of 166 feet; but still there was no water. Mr. Gataker then, at Mr. Plater's request, visited the well, and said it was useless to continue working at that spot, for no water would be found; but he felt absolutely confident that by sinking a well only 39 feet away, there ought to be a plentiful supply of water at about 100 feet. Mr. Plater acted on his advice; and at 116 feet an abundant supply was found. The old well, though so close, is said to be still perfectly dry.

Sales of Stock and Shares.—Last Tuesday, Messrs. Alexander, Daniel, and Co., of Bristol, sold by auction £1540 worth of the Bristol Gas Company's 5 per cent. maximum ordinary stock. The reserve price was £127 per cent.; and lots sold at prices ranging from £127 17s. 6d. to £128 2s. 6d. On the same day, Messrs. J. G. Killingworth and Son, of Boston, disposed of some £25 shares in the Boston Water Company at £52 5s. each; and a few old shares in the Boston Gas Company at £18 15s. each. A number of new shares in the latter Company changed hands at £15 10s. On Wednesday, a sale of Richmond gas stock was held at Richmond, when £60 of ordinary "A" stock (dividend of 10 per cent.) was disposed of for £156; a similar lot realizing the same sum. Two lots of £60 ordinary "B" stock (bearing 10 per cent. dividend so long as the price of gas does not exceed 3s. 6d. per 1000 cubic feet) also fetched £156 each. Two lots of £50 ordinary "C" stock (maximum dividend 7 per cent.) realized £93 and £100 respectively. At the same sale, £100 of 5 per cent. debenture stock fetched £152, and £90 of this stock went for £137. Two additional £60 lots of "B" stock were sold for £153 each; a £50 lot fetched £129; and a £30 lot realized £78. Another £60 lot of "A" stock was disposed of for £130. On the same day, £4000 of new capital in the Winchester Water and Gas Company was offered for sale by public auction; the following prices being realized: Four £25 shares, £43 10s. each; two, £43; 14, £42 15s.; 31, £42 12s. 6d.; 104, £42 10s.; five, £42 7s. 6d. The amount obtained by the sale was £6811 15s.

CARBURETTED WATER-GAS APPARATUS

Merrifield—Westcott—Pearson Patents.

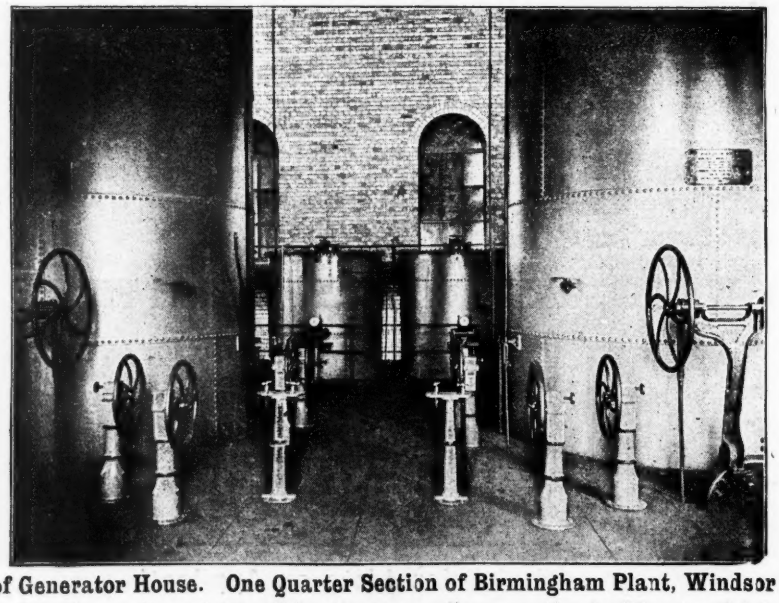
The Economical Gas Apparatus Construction Co., Ld.

London Offices: 19, ABINGDON STREET, WESTMINSTER, S.W.
American Offices: TORONTO. TELEGRAPHIC ADDRESS: "CARBURETED, LONDON."

W. H. PEARSON, Chairman.
W. H. PEARSON, Junr., Deputy-Chairman.
J. T. WESTCOTT, M.E., Manager.
L. L. MERRIFIELD, M.Inst.M.E., Engineer.

CARBURETTED WATER-GAS ENGINEERS.

THE M.-W.-P. PLANT is designed to use the Heaviest as well as the Lightest Grade of Oil.



RESULTS PROVE EFFICIENCY.

Working Floor of Generator House. One Quarter Section of Birmingham Plant, Windsor Street Station.

The Maximum Daily Capacity of the Birmingham Corporation's Plant, which was erected by this Company, is 10 MILLION CUBIC FEET.

Suicide by Coal Gas.—A short time since, Dr. Gordon Hogg held an inquiry respecting the death of Edith Jermyn Beaufort, the wife of a London journalist, but separated from her husband, which took place some days previously at her residence in Cornwall Grove, Chiswick. Deceased occupied a flat, and endeavoured to gain a livelihood by literary work. Her husband's desertion of her preyed upon her mind; and in a condition of mental depression she stopped up all the openings in the room, and turned on the jets of a gas-stove. When the room was entered, she was found dead upon a chair. The Jury returned a verdict of "Suicide during temporary insanity."

Claim as to Land Taken for the Staines Reservoirs Scheme.—Sir Charles Gibbons, Bart., the owner of certain property at Staines known as Stanwell Place, with a considerable quantity of ground adjacent, has claimed from the Staines Reservoirs Joint Committee compensation to the amount of £35,000, for land taken or injuriously affected by the water-works they are about to carry out under their Act of 1896. The matter has been referred to arbitration; the Umpire being Mr. A. R. Stenning. Witnesses for the claimant put the value of the property affected at £34,242, £34,500, £37,401, and £34,925; those for the Committee being £10,182, £10,425, £10,249, and £10,436. The Umpire has reserved his award.

Explosion of Acetylene at St. Neots.—An explosion of acetylene gas occurred at the Carlyon Arms, St. Neots, last Saturday week. A generator has lately been fixed for the purpose of lighting the premises; and the manufacturer who supplied the apparatus left full instructions as to its cleaning and recharging. Just before the accident, a Mr. C. Rundle and Mr. F. Cawrse entered the cellar with a lighted candle for the purpose of performing that operation. It is supposed that a quantity of gas had been left in the generator; and on the latter being opened, the gas mixed with the air and the lighted candle caused the explosion. Mr. Cawrse's left eye was seriously injured, and his hair was singed close to his head. Mr. Rundle was also hurt; but not to the same extent.

Rochdale Corporation Water Supply.—At a recent meeting of the Water Committee of the Rochdale Corporation, the Water Engineer (Mr. W. T. Tomlinson) submitted a highly satisfactory account of the past year's work in his department. The reduction of the deficiency on the water-works exceeded the most sanguine expectations of the Committee. On the 25th of March last year, the deficiency amounted to £3862; on the corresponding date this year it was £2465—a reduction of no less than £1397. The water-rentals show a very gratifying increase. The amount received for water-rentals for domestic purposes is £780 more than in 1896-7; and there is an increased revenue from water sold for trade purposes amounting to £121. The total additional money received on the water-works during the year is £901. With this amount, together with a sum derived from various reductions in the items of expenditure, the Committee have been able to reduce the deficiency by £1396. The amount required by the Water Department from the rates this year is equal to about a 2d. rate. The reduction in the deficiency is going on faster than was expected.

The Bradford Gas Suffocation Case.—The adjourned inquiry concerning the death of William Albert Moore, who was suffocated by gas at Bradford during the Easter holidays, under exceptionally distressing circumstances, was held last Tuesday (see *ante*, p. 902), when further evidence was offered; the Coroner explaining that the brother of the deceased, whom they had desired to give evidence, had died since. A verdict of "Accidental suffocation by gas" was returned.

Concessions for Consumers of Manchester Gas.—The City Council of Manchester are to be asked at their meeting to-morrow to make some important concessions to two sections of the gas consumers. From time to time the consumers in the out-districts of the City have agitated for the abolition of the differential price they have so far been called upon to pay; but the City Council have hitherto for various reasons resisted any efforts the Gas Committee have made in this direction. In the near out-townships, the differential rate is 6d. per 1000 cubic feet; and in the remote out-townships 1s. It is now proposed that the differential rate shall be reduced to 3d. all round; making the price 2s. 6d. per 1000 cubic feet, as against 2s. 3d. within the city boundaries. It is further proposed that meter-rents shall be abolished in the out-townships, as they have been for some time within the city. Another proposal is to give the prepayment consumers 30 cubic feet of gas for a penny, instead of 25 cubic feet. These concessions, which it is proposed shall come into effect as from Sept. 29 next, will entail a temporary loss of revenue to the extent of between £13,000 and £14,000 per annum.

The Proposed Purchase of the Norwich Water-Works by the Corporation.—At a meeting of the Norwich Town Council last Tuesday, a long report was read from the Law and Parliamentary Committee respecting the proposed purchase of the undertaking of the Norwich Water Company. Mr. Hackblock said that, in accordance with the direction of the Council, the Committee had opposed the Company's Bill; this step being rendered necessary by the fact that the Directors were unwilling to meet the Committee, and if they succeeded with their Bill the Council would have no opportunity for fifteen years of settling the differences between them and the Company. The Committee hoped to be able to reduce the amount of capital to be raised, so that the Company would have to go to Parliament before the expiration of so long a period. The Committee were not successful in their opposition; but this could not be wondered at when it was remembered that the witnesses for the Company stated that they wanted to spend from £50,000 to £60,000 almost immediately in constructing new storage reservoirs. The Corporation's witnesses were obliged to admit that the Council did not wish to stop necessary work. The Committee were desirous of coming to some conclusion with regard to the purchase of the undertaking before they took the extreme step of introducing a Bill, which was a very expensive matter; and it would be some time before the Corporation could expect to make any profit out of the undertaking. It was unanimously resolved—"That the report be adopted, and that the Committee be authorized to negotiate with the Directors of the Norwich Water-Works Company for the purchase by agreement of the undertaking of the Company, and to report to the Council thereon."

The Directors of the Tottenham and Edmonton Gas Company have decided to adopt stoking machinery in their retort-house, which is now undergoing considerable alteration; and they have placed an order with Sir William Arrol and Co., Limited, for a complete installation of the Arrol-Foulis charging plant, with the necessary coal breakers, elevators, and hydraulic pumping engines. The same firm have received a somewhat similar order for stoking plant for the Southend Gas Company; and at present they have no less than fifty machines in course of construction for various gas-works in England and on the Continent.

Messrs. Fletcher, Russell, and Co., Limited, have received a first order for 500 of their latest design in small grillers, which has been named the "Salford," or "Palatine," as their stock pattern. This griller has been designed specially for prepayment meters; and it was selected by the Salford Corporation in competition with other grillers designed for the same purpose by other manufacturers. In the "Salford" griller, the grilling space is 9½ inches wide and 7½ inches deep; and the griller is 5½ inches high. The arrangement of the burners and plates is quite new, and has been patented. Both are removable at will; and the burners can be fixed at either end as desired. The griller is very simple in construction, and at the same time neat and effective in design.

Exhibitions of gas appliances have lately been held by the following firms: Messrs. Fletcher, Russell, and Co., at Chester, and in Edinburgh, with lectures by Mrs. Young and Miss Golding; Messrs. W. Parkinson and Co., at Smethwick, with lectures by Miss E. Sanderson; Messrs. Richmond and Co., Limited, at Airdrie, Blackpool, Didsbury, Exmouth, Halifax, Hamilton (in conjunction with the Cannon Hollow-Ware Company), Ilfracombe, Morecambe, Oldham, Rochdale, Shrewsbury, Swansea, Sydenham, Tottenham, Tranmere, and Welshpool, among the lecturers being Misses Beeton, Lennard, Richmond, Stansfield, and Surridge; Messrs. John Wright and Co., Limited, at Bangor and Southport, with lectures by Mrs. Thwaites and Miss J. Barker; and Messrs. C. Wilson and Sons, at Bradford, with demonstrations by Miss Holroyd.

We have received from the New Conveyor Company, Limited, of Smethwick, a pamphlet descriptive of their elevators, conveyors, and other plant for the transmission of materials. The matter is partly reprinted from the "Engineer," and it is accompanied by illustrations of the various appliances manufactured by the Company, as well as by five plates showing the installation of coal conveying, screening, and sorting plant erected by them at the Aberaman Colliery. The Company, the Chairman and Managing-Director of which is Mr. Gilbert Little, have in hand contracts for upwards of sixty automatic coal and coke transmitting plants. Evidence of the rapid growth of the undertaking will be afforded by the statement that, when Mr. Little started his new workshops at Smethwick two years and a half ago, the machine shops and erecting yards occupied only 1400 square yards, whereas now they cover 16,000 yards of freehold land.

NOTICE TO ADVERTISERS.—COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office *not later* than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of, PERMANENT ADVERTISEMENTS should be received not later than the FIRST POST on SATURDAY.

GWYNNE & BEALE'S

PATENT

GAS-EXHAUSTERS AND STEAM-ENGINES

FOR FULL PARTICULARS, APPLY TO THE MAKERS:

GWYNNE & CO.,

Telegrams: "GWYNNEGRAM, LONDON."

HYDRAULIC AND GAS ENGINEERS

Telephone No. 95 Holborn.

(Late Essex Street Works, Victoria Embankment, London),

BROOKE STREET WORKS, HOLBORN, LONDON, E.C.

GAS PURIFICATION AND CHEMICAL COMPANY, LIMITED.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale than all other Oxides combined. Purity and uniformity of quality guaranteed.

JOHN WM. O'NEILL, Managing Director, 160, 161, & 162, PALMERSTON BUILDINGS, OLD BROAD STREET, LONDON, E.C.

ANDREW STEPHENSON, AGENT. All communications re Oxide to the Company as above.

WINKELMANN'S "VOLCANIC" and "VOLCUM" CEMENT. Fire Resistance up to 4500° Fahr. In use in Gas-Works all over the World.

ANDREW STEPHENSON, 182, PALMERSTON BUILDINGS, OLD BROAD STREET, LONDON, E.C.

Telegrams: "Volcanism, London."

BROTHERTON & CO.

Offices: Commercial Buildings, LEEDS. Correspondence invited.

TUBES for Gas, Steam, and Water (all Sizes) Welded or Riveted. TANKS, HYDRAULIC MAINS, RETORT-LIDS, &c.

JOHN SPENCER, Globe Tube Works, WEDNESBURY; and 14, Great St. Thomas Apostle, LONDON.

J. & J. BRADDOCK, Globe Meter Works, Oldham.

First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.

Telegraphic Address: "Braddock Oldham."

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Limited, Chemical Works, Leeds, specially produce this ACID from SULPHUR, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

PORTER & CO., Gowts Bridge Works, LINCOLN, Engineers, Ironfounders, and Contractors for the erection of Gas-Works for Towns, Villages, Mansions, Manufactories, Collieries, and Isolated Buildings at home and abroad. Manufacturers of Retorts and Fittings, Condensers, Scrubbers, Purifiers, Valves, &c.; also of Girders, Wrought and Cast Iron Tanks, Iron Roofs, &c.

Telegraphic Address: "PORTER LINCOLN."

[For Illustrated Advertisement, see p. 1029.]

AMMONIACAL LIQUOR wanted.

BROTHERTON AND CO., Ammonia Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

HUTCHINSON BROTHERS, Gas Engineers, &c., Falcon Works, Barnsley, Makers of Wet and Dry Gas-Meters, Brass-Work, and general Gas Apparatus, Lead Saturators, Tanks, &c., Tools, and Gas-Works Sundries. (See p. 968, last week's issue.)

Telegrams: "HUTCHINSON BROS., BARNSLEY."

GAS PURIFICATION.

OXIDE OF IRON BOG ORE.

BALE & CO.'S Oxide of uniform quality. SPECIAL FIRE CEMENT, OXIDE PAINTS, OILS, SULPHURIC ACID, &c.

120 and 121, NEWGATE STREET, LONDON, E.C.

Telegrams: "BOGORE, LONDON."

SULPHURIC ACID for Sale.

BROTHERTON AND CO., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

GAS CARBON Wanted, not less than 4-Ton Loads.

Apply to the BRIMINGTON CARBON COMPANY, Sowerby Bridge, YORKS.

TO GAS AND WATER OFFICIALS.

SPECIALLY favourable terms for Cycles. First-Class Workmanship and Material guaranteed. Art Catalogue post free.

MELROSE CYCLE COMPANY, COVENTRY.

GAS TAR wanted.

BROTHERTON AND CO., Tar Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

SULPHATE OF AMMONIA SATURATORS.

WALTER THOMASON and SONS, Chemical Plumbers, &c., and Makers of Lead Saturators, &c., 21, WESTON STREET, BOLTON. Repairs of every description.

Please write for Estimate before ordering elsewhere.

PATENTS FOR INVENTIONS.

J. C. CHAPMAN, M.I.M.E., and Fel. Chartered Inst. Patent Agents. ADVICE ON ALL MATTERS CONNECTED WITH ABOVE. Information and Handbook on application. 70, CHANCERY LANE, LONDON, W.C.

SULPHATE OF AMMONIA SATURATORS.

JOSEPH TAYLOR & CO., Chemical Plumbers, &c., and Makers of every description of Solid Plate Lead and Timber Cased Saturators, &c., CENTRAL PLUMBING WORKS, TOWN HALL SQUARE, BOLTON. Special attention to Repairs. Before placing Orders, please write for Estimate.

SPENT OXIDE wanted. BROTHERTON AND CO., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

SADLER & CO., Ld., Middlesbrough; ULVERSTON (BARROW); PORTSMOUTH; CARLTON (N.E.R.); and STOCKTON. Tar and Petroleum Distillers. Benzol and Petroleum Spirit, 700 and other Gravities specially prepared for Carburetting. SOLAR OIL for Gas Making, Kerosene, &c. Correspondence invited. Telegraphic Address: "SADLER, MIDDLESBROUGH."

NEW GAS PLANT CEMENT.

JOHN E. WILLIAMS AND CO., VICTORIA PAINT WORKS, MANCHESTER. For all Joints in connection with Oil-Gas Plant and Sulphate Plant. For all Gas Joints. For all Tar Joints. For all Ammonia Joints.

CANNEL, COAL, ETC.

JOHN ROMANS & SON, EDINBURGH, Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS and WATER WORKS. Prices, &c., will be forwarded on application to No. 80, ST. ANDREW SQUARE, EDINBURGH, / NEWTON GRANGE, NEWBATTLE, DALKEITH, } SCOTLAND.

IMPORTANT.

OLD Retorts made equal to new by repairing them with CROWTHER'S PATENT STICKFAST FIRE CEMENT. Unequalled for Repairing Inclines. Can be used in Hot or Cold Retorts; and "A1." for Mouthpiece Joints. Satisfaction Guaranteed. CROWTHER, Practical Retort Setter, Manor Street, HUDDERSFIELD.

HYDRATED OXIDE OF IRON.

PREPARED from pure Iron. Two or three times as rich as Bog Ore. Strong action on Sulphuretted Hydrogen. To be used alone, but will increase activity of other Oxides. Less than half the price of Bog Ore. Can be lent on hire. Write for tabulated results. READ HOLLIDAY AND SONS, LIMITED, HUDDERSFIELD.

WATER-GAS PLANT.

ENGINEERS contemplating the above are invited to communicate with the Advertiser, who is prepared to give every assistance in designing Plant of any capacity. J. L. FEATHERSTONE, 30, Amesbury Avenue, STREATHAM HILL.

SITUATION wanted by Married Man as METER INSPECTOR and COLLECTOR. Experienced. Highest References. Apply, by letter, to No. 3049, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

MANAGER'S Son (age 17) desires appointment with Gas Engineer. Experience in Gas Company's Accounts and Manufacture. First-Class References. Address No. 3051, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TO ACETYLENE GAS MANUFACTURERS.

A GENTLEMAN who is well acquainted with all the Australian Colonies, and who has considerable influence there, is desirous of introducing above, either to float Subsidiary Companies or to arrange Royalties on Generators. Address COLONIAL, care of Todd & Co., Advertising Agents, MANCHESTER.

WANTED, a good Gas-Fitter, used to Iron and Compo. Willing to make himself useful. Wages 30s. per week. Apply to BENJAMIN BARK, Gas-Works, GODALMING.

WANTED, at a Gas-Works on the South Coast, a Young Man as Retort Setter, &c. State Age, Experience, and Wages required. Apply, by letter, to No. 3052, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

A GAS Engineering Firm in the Mid- lands require the services of Two DRAUGHTSMEN, acquainted with Gas-Works, and with a good mechanical training. Apply, by letter, to No. 3050, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TEMPORARY employment found for Two good MAIN LAYERS. Apply to the GAS MANAGER, Ilford, ESSEX.

GAS TUBES AND FITTINGS.

OLD-Established Manufacturer requires an AGENT calling upon all Gas Companies in the United Kingdom. Must have good Connection. Liberal Commission. Address No. 3039, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

ALDERSHOT GAS AND WATER COMPANY.

WANTED, a thoroughly qualified Gas- FITTER, to take charge of the Farnborough District. The person appointed must be capable of generally Superintending the Distribution of Gas, make out Estimates, take Indices of Meters, and keep account of Stores, &c. Wages to commence at 35s. per week. Applications, stating Age and Experience, to be addressed to the Manager, Mr. J. MEIKLEJOHN, Gas-Works, Ash Road, ALDERSHOT.

CITY OF LEEDS.

THE Gas Committee require the services of an ASSISTANT to the Superintendent of the Mains and Services Department. Applicants must possess a thoroughly practical knowledge of Main and Service laying, and the Distribution of Gas. Salary £125 per annum. Applications, stating Age and Experience, with *copies* of not more than three recent Testimonials, and addressed to the undersigned, endorsed "Assistant Mains Department," will be received not later than Saturday, May 7. Canvassing Members of the Corporation will disqualify Candidates.

JNO. HARRISON, Town Clerk.

April 23, 1898.

WANTED, Carbon in 4 Ton Lots, or more. State Price, f.o.r. at nearest Station, to No. 3031, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, Two second-hand Purifiers, 8 or 10 feet square, suitable for Sulphate of Ammonia Plant; also a set of CONDENSERS required for same. Apply with Prices and Particulars to ALBERT R. CAWLEY, Manager and Secretary, Gas Company, LLANELLY.

PURIFIERS, &c., WANTED.

WANTED, a Four or Six Set of second- hand PURIFIERS, in good condition, not less than 20 feet square. Also a set of WROUGHT-IRON ANNULAR CONDENSERS, ½ to 1 Million capacity, either in single or double set. Apply, in first instance, to No. 3034, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

CHEAP BENZOL.

AT the present low Prices, Benzol is very much the cheapest Enricher for Gas. Apply to SADLER AND CO., MIDDLESBROUGH.

FOR SALE—Sulphate of Ammonia PLANT, suitable for Works Carbonizing 4000 Tons of Coal per annum. Built by Abbott & Co., London. Apply to the CLIFTON AND KERSLEY COAL COMPANY, LIMITED, Clifton, near MANCHESTER.

CORPORATION OF SOUTHPORT.

(GAS DEPARTMENT.)

FOR SALE—One 20-inch Station Gas GOVERNOR (Cowan's Patent), in use Four Years. Particulars and Price may be obtained from the ENGINEER, Gas-Works, SOUTHPORT.

FOR SALE, Cheap—The under- mentioned GAS PLANT:— 2 PURIFIERS, 5 ft. square by 4 ft. deep. 1 PURIFIER, 5 ft. square by 2 ft. 9 in. deep. CONDENSER, 4 inches diameter, Vertical Pipes. EXHAUSTER (Gwynne's), 20,000 c. f. per hour. Apply to SAML. WHILE AND SONS, 60, QUEEN VICTORIA STREET, E.C.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. **Compare Prices and Particulars before ordering elsewhere.** J. F. BLAKELEY, Gas Engineer, Ravensthorpe, YORKS.

THE Todmorden Corporation Gas De- partment have the following SECOND-HAND MATERIALS FOR DISPOSAL, and the same can be seen on application to the Engineer, H. Hawkins, at the Gas-Works, Millwood, Todmorden:— One Vertical 8-inch EXHAUSTER, by Geo. Anderson, with Valves and Connections. Six 18-inch RACK and PINION VALVES. Six 14-inch RACK and PINION VALVES. One SQUARE STATION METER (which is now in action), capable of passing 25,000 cubic feet per hour (Makers Newton & Braddock), with Valves and Connections. Also One ROUND STATION METER (by the same Makers), to pass 5000 cubic feet per hour, with Valves and Connections; and One 7-inch TOWN GOVERNOR by J. & J. Braddock, with Connections belonging thereto.

FOR SALE—A Modern Sulphate of AMMONIA STILL, built by Messrs. R. & J. Dempster, Manchester, 1893, with separate Liming Compartment. Capacity, with ordinary Liquor, 5000 to 6000 lbs. of Sulphate per day. For further Particulars, apply to the BRYMBO STEEL COMPANY, LIMITED, near WREXHAM.

FOR SALE by Private Treaty, as a going Concern, the well-established BUSINESS OF THE ANTI-VIBRATION INCANDESCENT LIGHTING COMPANY, LIMITED, Bradford (who are Manufacturers of the Anti-Vibration Frames, Goods, &c., for Incandescent Lights), including the valuable PATENTS, STOCK-IN-TRADE, PLANT, TOOLS, FIXTURES, and also the BOOK DEBTS. Central Premises. Tenders to be accompanied by a 10 per cent. deposit. For full Particulars, apply to HENRY FREDERICK HARTMAN, Liquidator, Messrs. Butterfield and Hartman, Chartered Accountants, City Chambers, BRADFORD.

DENTON URBAN DISTRICT COUNCIL.

(GAS DEPARTMENT.)

COAL.

THE Gas Committee invite Tenders for the supply of COAL, the same to be sent in on or before the 11th of May inst. Specification and Form of Tender to be obtained from the Manager, Mr. J. Chadwick Smith, Gas-Works, Denton. The Committee do not bind themselves to accept the lowest or any Tender.

By order, JOHN RICHARDS, Clerk to the Council.

April 28, 1898.

DENTON URBAN DISTRICT COUNCIL.

(GAS DEPARTMENT.)

TAR.

THE Gas Committee invite Tenders for TAR, the same to be sent in on or before the 11th of May inst. Particulars to be obtained from the Manager, Mr. J. Chadwick Smith, Gas-Works, Denton. The Committee do not bind themselves to accept the highest or any Tender.

By order, JOHN RICHARDS, Clerk to the Council.

April 28, 1898.

CORPORATION OF LEICESTER.

GAS COAL.

THE Gas and Electric Lighting Com- mittee of the above Corporation are prepared to receive TENDERS for the supply of COAL, COBBLES, or NUTS (about 140,000 Tons per annum) for One or Two Years ending May 31. Particulars and Form of Tender can be obtained on application to the Engineer. Tenders, addressed to Alderman Lennard, Chairman, and endorsed "Tender for Gas Coal," to be delivered at these Offices not later than Eleven o'clock a.m. on Saturday, May 7 next. The Committee do not bind themselves to accept the lowest or any Tender.

ALFRED COLSON, M.Inst.C.E., Engineer and Manager.

Offices: Millstone Lane, Leicester, April 19, 1898.

CORPORATION OF LEICESTER.

PURIFIER-GRIDS.

THE Gas and Electric Lighting Com- mittee of the above Corporation are prepared to receive TENDERS for the supply and fixing of GRIDS for seven Purifiers, 32 feet square, in three tiers, at their Aylestone Road Works. Specification and Form of Tender may be obtained upon application to the Engineer. Tenders, addressed to Alderman Lennard, Chairman, and endorsed "Tender for Purifier-Grids," to be delivered at these Offices not later than Eleven o'clock a.m. on Saturday, May 7 next. The Committee do not bind themselves to accept the lowest or any Tender.

ALFRED COLSON, M.Inst.C.E, Engineer and Manager.

Offices: Millstone Lane, Leicester, April 20, 1898.

MANCHESTER CORPORATION GAS-WORKS.

AMMONIACAL LIQUOR.

THE Gas Committee of the Corporation of Manchester are prepared to receive TENDERS for the purchase and removal of the AMMONIACAL LIQUOR to be produced at the Gaythorn, Rochdale Road, and Bradford Road Gas-Works during a period of one or more Years, commencing at Noon on the 30th day of June, 1898. The Committee do not bind themselves to accept the highest or any Tender. Sealed Tenders, addressed to the Chairman of the Gas Committee, and endorsed "Tender for Ammoniacal Liquor," must be delivered at the Offices of the Gas Department, Town Hall, on or before Wednesday, the 25th day of May, 1898. Forms of Tender and further Particulars may be obtained on application (in writing only) to Mr. Charles Nickson, Superintendent of the Department. A Deposit of One Guinea (which will be returned on receipt of the Tender) must accompany each application for a Tender form.

By order of the Gas Committee, WM. HENRY TALBOT, Town Clerk.

Town Hall, Manchester, April 29, 1898.

THE URBAN DISTRICT COUNCIL OF PADIHAM.
(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for the supply of a SCRUBBER-WASHER for 500,000 cubic feet per day, with Steam-Engine to drive the same.

For Particulars apply to

J. R. SMITH,
Gas Manager.

Gas-Works, Padiham,
April 28, 1898.

DUNFERMLINE GAS COMMISSIONERS.

THE Dunfermline Gas Commissioners are prepared to receive TENDERS for the supply and erection of the following Plant:—

(1) CORNISH BOILER, 18 ft. by 5 ft. 6 in. diameter.
(2) EXHAUSTER and ENGINE, capable of passing 30,000 cubic feet of Gas per hour.
(3) STATION GOVERNOR, with 12-inch Connections and Bye-Pass.

Further Particulars may be obtained from the undersigned, to whom sealed and endorsed Tenders must be sent not later than the 7th of May, 1898.

The Commissioners do not bind themselves to accept the lowest or any Offers.

HUBERT POOLEY, Assoc.M.Inst.C.E.,
Engineer.

Gas-Works, Dunfermline, N.B.,
April 25, 1898.

DUKINFIELD URBAN DISTRICT COUNCIL.
(GAS DEPARTMENT.)

TENDERS FOR COAL AND CANNEL.

THE Gas Committee require Tenders for the supply of 7500 Tons of COAL and CANNEL.

Particulars and Forms of Tender can be had from the undersigned.

Tenders, endorsed "Coal," will be received by Mr. Councillor Stafford here not later than Twelve o'clock noon on Monday, the 9th of May.

The Committee are not bound to accept any Tender.

HARRISON VEEVERS, C.E.,
Engineer and Manager.

Gas Offices, Dukinfield,
April 26, 1898.

HUNSTANTON GAS-WORKS.

CONTRACT FOR GASHOLDER TANK.

THE Urban District Council of New Hunstanton are prepared to receive TENDERS for the construction of a GASHOLDER TANK.

Drawings may be seen, and Bills of Quantities obtained, on and after Wednesday, May the 4th, at the Offices of the Council, Hunstanton, or at the Office of the Engineers, Messrs. Stevenson and Burstal, 38, Parliament Street, Westminster, S.W., upon payment of One Guinea, which will be returned upon receipt of a *bond-fide* Tender.

Sealed Tenders, endorsed "Tender for Gasholder Tank," are to be forwarded to the undersigned not later than Monday, May 16, 1898.

J. S. B. GLASIER,
Clerk to the Council.

CAST-IRON WATER-PIPES.

THE Water Committee of the Corporation of the Borough of Deal, Kent, invite TENDERS for the supply forthwith of about 180 Tons of best CAST-IRON SOCKET and SPIGOT PIPES for Water-Mains (sizes 6 inches to 9 inches); and for about 5 Tons of SPECIALS to suit.

For Particulars, Specification, and Form of Tender (which may be obtained on payment of a Deposit of £1, returnable on receipt of a *bond-fide* Tender), apply to the undersigned.

Tenders, endorsed "Tender for Water-Mains," must be delivered to me, at my Office, Western Road, Deal, on or before noon of Wednesday, May 11, 1898.

The Committee do not bind themselves to accept the lowest or any Tender.

J. F. CULLEN,
Water Engineer.

BOROUGH OF BARROW-IN-FURNESS.

SUPPLY OF COAL AND CANNEL.

THE Corporation are prepared to receive TENDERS on Forms to be obtained at the Office of the Gas and Water Manager for the supply of screened GAS COAL and CANNEL, for the Year ending the 30th of June, 1899.

Tenders, addressed to the Chairman of the Gas and Water Committee, and endorsed "Tender for Coal," to be delivered at the Town Clerk's Office, not later than Twelve o'clock noon on Wednesday, the 11th day of May, 1898.

The lowest or any Tender not necessarily accepted.

By order,
C. F. PRESTON,
Town Clerk.

Town Clerk's Office, Town Hall,
Barrow-in-Furness, April 29, 1898.

NEW MILLS URBAN DISTRICT COUNCIL.

TENDERS FOR GAS COAL, &c.

THE New Mills Urban District Council invite TENDERS for the supply of best GAS COAL and CANNEL for the Year ending June 30, 1899.

Form of Tender and full Particulars may be had on application to Mr. E. Jones, the Gas Manager.

Tenders to be sent in to me the undersigned not later than the 10th of May, 1898.

Tenders are also invited for the purchase of surplus TAR and LIQUOR for One Year ending June 30, 1899.

The Council do not bind themselves to accept the lowest or any Tender.

JOSEPH POLLITT,
Clerk.

Town Hall, New Mills,
April 28, 1898.

TENDERS FOR GAS COAL.

THE Directors of the Cheltenham Gas-Light and Coke Company invite TENDERS for the supply of 34,000 Tons of GAS COAL extending over a period of Twelve Months from the 1st of August next.

Particulars may be obtained from the undersigned, to whom Tenders, endorsed "Tender for Coal," must be delivered on or before Thursday, the 19th of May.

The Directors do not bind themselves to accept the lowest or any Tender.

R. O. PATERSON.

Gas-Works, Cheltenham,
April 30, 1898.

RAMSGATE CORPORATION.
(GAS AND WATER DEPARTMENT.)

THE Gas and Water Committee invite TENDERS for about 540 feet of STOURBRIDGE or other approved quality FIRE-CLAY RETORTS, 22 in. by 16 in., about 18,000 FIRE-BRICKS, TILES, and about 10 Tons of CLAY.

Tenders to be sent in on or before noon on Monday, the 16th of May, 1898, addressed to the Chairman of the Gas and Water Accounts Committee, Hardres Street, Ramsgate, endorsed "Tender for Fire-Clay Goods."

Specification and full Particulars on application to

WILLIAM A. VALON,
Engineer.

TENDERS FOR GAS COAL.

THE Corporation of Droitwich invite TENDERS for the supply of from 1100 to 1300 Tons of best screened GAS COAL, to be delivered free at Droitwich (G.W.) Railway Station, at such times and in such quantities as may be required, prior to the 31st of May, 1899.

Particulars and Form of Tender may be obtained on application to the Manager of the Gas-Works.

Sealed Tenders, on the form provided for the purpose (with the Analysis of the Coal to be supplied), endorsed "Tender for Gas Coal," to be sent to the undersigned on or before the 6th of May.

The Corporation do not bind themselves to accept the lowest or any Tender.

S. JOHN TOMBS,
Town Clerk.

Droitwich, April 21, 1898.

CORPORATION OF NOTTINGHAM,
(GAS DEPARTMENT.)

TENDERS FOR COALS.

THE Gas Committee are desirous to re-ceive OFFERS for supplies of COALS, COBBLES, or NUTS, for the period terminating the 30th of June, 1899.

The large Coals and the Cobbles or Nuts are to be separately delivered, where and as from time to time directed, by and at the expense of the Contractors, upon the Gas-Works Siding, Great Northern Railway, in the East Croft at Nottingham, and also on the Gas-Works Sidings, Midland Railway, at Radford and Basford respectively; and at and after the rate of one-eighth part of such total quantity in each calendar month, commencing with the month of July next, till the Corporation shall be satisfied with the amount of accumulated Stock, and afterwards at such rate as shall be from time to time directed, till the agreed quantity shall have been delivered.

The Coals, Cobbles, or Nuts are to be the best of their respective kinds, freshly wrought and WELL SCREENED (description, sizes, and inclination of screen to be specified), to be as free as possible from Sulphur, Bats, Bind, Refuse, and Dirt, and shall be weighed (20 cwt. to the ton) upon the Corporation Machines, or upon such other Machines as may be mutually agreed upon.

Payments will be made monthly, if and so long as the contract shall be duly fulfilled.

The Corporation do not bind themselves to accept the lowest or any Tender.

Further Information and forms on which the Tenders must be made, may be obtained on application to me, at the General Manager's Office; and the Tenders (sealed), specifying the description of Coals, the Seam, and the Pits at which they are to be raised, and stating the Prices for deliveries at the several places and in manner and subject to the conditions aforesaid, must be delivered to SIR SAMUEL GEORGE JOHNSON, KT., Town Clerk, on or before Saturday, the 7th day of May, 1898.

By order,
WILLIAM REGINALD CHESTER,
Engineer and General Manager.

Corporation Gas Offices, George Street,
Nottingham, April 28, 1898.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his AUCTIONS of STOCKS and SHARES in London, Suburban, and Provincial Gas and Water Companies are held MONTHLY, at the Mart, Tokenhouse Yard, E.C.

He also undertakes the issuing by Auction of Gas and Water Stocks and Shares under Parliamentary Powers.

Terms for issuing such Capital, and also for including Gas and Water Stocks and Shares in these periodical Sales, can be obtained on application at Mr. Alfred Richards's Offices, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the

SOUTHEND WATER-WORKS COMPANY AND OTHER OWNERS.

MR. ALFRED RICHARDS will Sell BY AUCTION, at the Mart, E.C., on Wednesday, May 11, at Two o'clock, in Lots:—

500 £10 SHARES in the SOUTHEND WATER-WORKS COMPANY; also STOCKS and SHARES in the LEWES GAS COMPANY; WEST HAM GAS COMPANY, CHIGWELL, LOUGHTON, and WOODFORD GAS COMPANY, and EPPING GAS COMPANY.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

COLNEY HATCH GAS COMPANY.

NOTICE is Hereby Given, that a SPECIAL GENERAL MEETING of the Proprietors of the Colney Hatch Gas Company, will be held at the Offices of the Company, New Southgate, on Thursday, May 19 next, at Four o'clock in the Afternoon precisely, to pass such Resolution or Resolutions as may appear expedient to sanction the raising of further Capital authorized to be raised by the Colney Hatch Gas Company's Acts of 1866 and 1876.

By order,
ERNEST L. BURTON,
Secretary.

April 23, 1898.

Ready this Day—450 *Pages, Crown* 8*vo., with numerous Illustrations,* 10*s.* 6*d. Leather.*

THE
GAS ENGINEER'S POCKET BOOK,

Comprising Tables, Notes, and Memoranda relating to the Manufacture, Distribution, and Use of Coal Gas, and the Construction of Gas-Works.

By HENRY O'CONNOR, Assoc.M Inst.C.E.

London: CROSBY LOCKWOOD & SON,
7, STATIONERS' HALL COURT, E.C.

PRICE'S COKE & COAL BARROW

effects a great saving of time, labour, and expense.

For Particulars, Price, &c., apply to Mr. EDWARD PRICE, 119, Queen's Road, FINSBURY PARK, N.

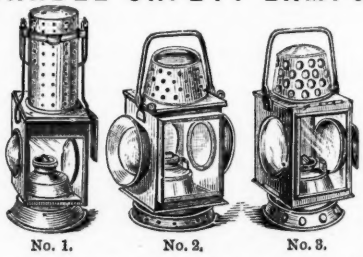
Prices are Reduced.

HEBBURN MAIN GAS COALS.

Yield of Gas per ton . . . . . 10,500 cub. ft.
Illuminating Power . . . . . 16·4 candles.
Coke . . . . . 68 per cent.

For Prices, f.o.b. Ship or Delivered by Rail, apply to
THE WALLSEND & HEBBURN COAL COMPANY, LTD.,
8 Lombard Street,
NEWCASTLE-ON-TYNE.
W. RICHARDSON, Fitter.

ARMSTRONG'S PATENT
CANDLE SAFETY LAMPS.



No. 1. No. 2. No. 3.

43, MANCHESTER STREET, GRAY'S INN ROAD, W.C.

Telephone: Castleford No. 214. | Postal Address: Castleford.
Telegrams: "Silkstone Castleford."

THE SILKSTONE & HAIGH MOOR COLLIERIES, LTD.
ALLERTON BYWATER, CASTLEFORD.
Steam, Manufacturing, & Gas Coals & Cannel.
Analysis, Contracts, Trial Waggons, and Quotations for Large and Small Orders. Inquiries Solicited.

COKE-BREAKERS,
PRICES REDUCED.
(THOMAS & SOMERVILLE'S PATENT)
With Elevators and Conveyors worked by Steam or Gas Engine.

GEORGE WALLER & CO.,
165, QUEEN VICTORIA STREET, E.C.
And at STROUD, GLOUCESTERSHIRE.

NEWBATTLE CANNEL.

Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO

THE LOTHIAN COAL COMPANY,

LIMITED,

NEWBATTLE COLLIERIES,

DALKEITH, N.B.

UNEQUALLED.

Gas Companies are solicited to try Samples of the

MIRFIELD

BLACK BED GAS COAL.

Prices and Analysis on application.

MIRFIELD (GAS-COAL) COLLIERY COMPY.

RAVENSTHORPE, NEAR DEWSBURY.

INCANDESCENT GAS LIGHTING

Has now gained a complete and final **Victory** over its last and greatest Enemy

VIBRATION,

BY MEANS OF

CLAY'S PATENT

SHOCK-PROOF

Incandescent Burner Fittings

Of which full Particulars may be had from

CLAY & WALMSLEY,

BOLTON, ENGLAND.

Telegrams: "CLAYS, BOLTON."

See "JOURNAL OF GAS LIGHTING," July 7, 1896, p. 19, and Dec. 21, 1897, p. 1365.

London Representatives: Messrs. Henry Greene & Sons, 153 & 155, Cannon Street, E.C.

GAS PURIFICATION BY

HYDRATED OXIDE.

THIS Material is of full Strength, and Exceptional Activity. It is specially prepared to minimize Back-Pressure; and will be supplied on Hire, or Sold, on the most favourable Terms.

SPENT OXIDES containing Blue, also CRUDE FERRO-CYANIDE PRODUCTS, either PURCHASED or EXCHANGED for FRESH OXIDE.

MANCHESTER OXIDE COMPANY, LTD.,

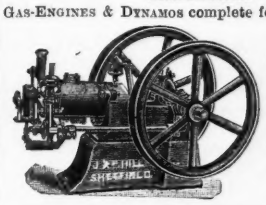
CANAL ST., MILES PLATTING, MANCHESTER.

HILL'S IMPROVED

"OTTO" TYPE GAS-ENGINES

½ H.P. to 20 H.P. Specially designed for Users of Small Power.

GAS-ENGINES & DYNAMOS complete for HOTEL, HOUSE, and SHOP **Installations.**



Gas-Engines and Pumps.

High-Class Workmanship.

J. & P. HILL,

Backfields & Norfolk Iron-Works,

SHEFFIELD.

BOLDON GAS COALS,

ANALYSIS.

Yield of Gas per ton	**10,500**	**Cubic Feet.**
Illuminating Power	**16·9**	**Candles.**
Coke	**66·7**	**Coke.**
Sulphur	**0·86**	**Sulphur.**
Ash	**2·04**	**Ash.**

For Prices, &c., apply to

W. H. PARKINSON,

THE HARTON COAL CO., LTD.,

NEWCASTLE-ON-TYNE.

Telegraphic Address: "PARKINSON NEWCASTLE."

LONDONDERRY GAS COALS

FROM THE

MARQUIS OF LONDONDERRY'S COLLIERIES,

COUNTY OF DURHAM.

Available output up to 5000 tons per day. Yield of Gas 11,000 cubic feet per ton of Coal as per analysis by Mr. John Pattinson, F.C.S., F.I.S.

FOR PRICES AND PARTICULARS, APPLY TO

S. J. DITCHFIELD,

SEAHAM HARBOUR, COUNTY OF DURHAM.

HOLMSIDE

GAS COALS.

Present Daily Produce over 5000 Tons.

Latest Analysis—By CHARLES PHILLIPS, Gas Examiner to Rotherham Corporation

Yield of Gas per Ton	11,205 Cubic Feet.
Illuminating Power	$16\frac{7}{10}$ Stand. Sperm. Candl.
Coke (of good & pure quality)	$13\frac{3}{4}$ Cwt. per Ton.
Sulphur	A little over 1 per Cent.
Ash	Under 1 per Cent.
Tar	163 lbs. (Avoir.) per Ton.
Ammoniacal Liquor	103 lbs. (Avoir.) per Ton.

HOLMSIDE GAS COALS are supplied to the largest Gas Companies in England and on the European Continent; London alone consuming about half the produce.

SOUTH MOOR

PELTON GAS COALS.

Present Daily Produce available 3000 Tons.

Of equal quality to the "Holmside" Coal, and also very largely used by many Gas Companies at Home and Abroad.

Both descriptions are shipped at Tyne Docks, and Dunston Staiths, River Tyne, also at North and South Docks, Sunderland.

These Coals may be bought through the Principal Merchants in England, or direct from

MR. MARK ARCHER,

HOLMSIDE & SOUTH MOOR OFFICES,

NEWCASTLE-UPON-TYNE.

REGENERATIVE RETORT-SETTINGS.

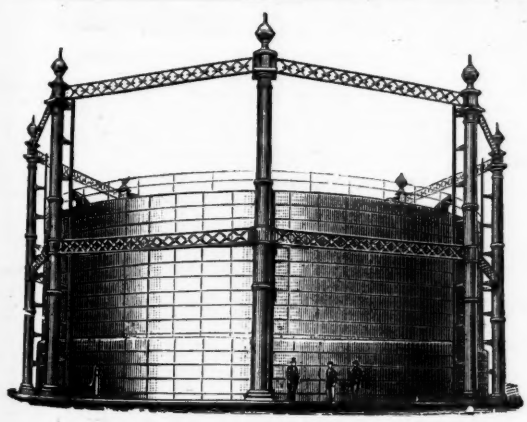
J. FIRTH BLAKELEY & CO., GAS ENGINEERS AND CONTRACTORS, RAVENSTHORPE, YORKS,

Have made arrangements with **Mr. ALEXANDER YUILL**, of Alloa, N.B., for the **SOLE RIGHT of BUILDING his REGENERATIVE FURNACES and SETTINGS OF RETORTS.**

By Mr. Yuill's Principle, the maximum quantity of Gas per Retort per diem may be obtained with the minimum amount of fuel.

Gas Managers who are desirous of improving their Settings should ask for Particulars and Prices before adopting any other principle. They give the best results, are reliable, and economical in construction.

GAS APPARATUS OF ALL KINDS SUPPLIED.



PORTER & CO.,

GAS ENGINEERS,

MANUFACTURERS, IRONFOUNDERS, & CONTRACTORS,

GOWTS BRIDGE WORKS,

LINCOLN.

Telegraphic Address: "PORTER LINCOLN." National Telephone, No. 13.

ESTIMATES FOR GAS-WORKS OF ANY SIZE.

References to 600 Works already erected.

N.B.—All Communications to be addressed to the FIRM ONLY.

HARRIS & PEARSON,

STOURBRIDGE, ENGLAND

MANUFACTURERS OF

FIRE-CLAY GAS-RETORTS, FIRE-BRICKS, LUMPS, & TILES of Every Description.

GLAZED BRICKS AND PORCELAIN BATHS.

MAURICE GRAHAM,
Managing-Director.

Telegrams:
"ACCOUPLE, LONDON."

GRAHAM, MORTON, & CO.

LIMITED,

GAS ENGINEERS & CONTRACTORS

INCLINED RETORT PLANTS—CONVEYING MACHINERY.

Send for our latest Pamphlet upon Inclined Retort Construction.

HEAD OFFICE: 79 & 80, AMBERLEY HOUSE, NORFOLK ST., STRAND, LONDON, W.C.

LONDON OFFICE
60, QUEEN VICTORIA ST. E.C.

TELEGRAPHIC ADDRESSES
"DRAKESON HALIFAX."
"ECLAIRAGE LONDON."

TELEPHONE No. 43.
"HALIFAX EXCHANGE"

GAS ENGINEERS.
CONTRACTORS.
IRONFOUNDERS.

JONAS DRAKE & SON

SOLE AGENTS FOR
HISLOP'S
PATENT REGENERATIVE FURNACES
—FOR—
ENGLAND, WALES & ABROAD.

RETORT BENCHES ERECTED COMPLETE
WITH OR WITHOUT SPECIAL FURNACES.
RESULTS GUARANTEED.

OVENDEN HALIFAX

RETORT SETTERS.
FURNACE BUILDERS.
ETC. ETC.

Designs and Estimates on Application.

GASEOUS FIRING A SPECIALTY.

MOBBERLEY & PERRY
STOURBRIDGE.

Manufacture & supply best quality of

Gas Retorts (SEGMENTAL, HORIZONTAL, or INCLINED.)

Special Bricks & Blocks for GENERATOR & REGENERATOR FURNACES.

FIRE BRICKS, LUMPS, & TILES, BLUE STAFFORDSHIRE VITRIFIED BRICKS FOR PAVING, &c. &c.

EVERY REQUISITE FOR GAS-WORKS. Retort Setters sent to any part of the Kingdom.

London Agents: Contractors for the erection of Retort-Benches complete.

BALE & HARDY, Gas Engineers and Contractors, BRIDGE HOUSE, 181, QUEEN VICTORIA STREET, E.C.

PREPAYMENT GAS-METERS.

POINTER & SCALE SYSTEM.

The convenience and economy of this System are well known.

The advantages inherent in the Pointer and Scale Principle of Price Adjustment have been rendered certain of attainment by providing a series of numbered holes into any one of which the Screw, which secures the Pointer, may be fixed. Thus any possible uncertainty in regard to the Setting of the Pointer is prevented.

The Coin itself operates the Prepayment Wheel when Gas is being purchased; and the Coin is not discharged into the Money Box till its full value in Gas has been placed at the Consumer's disposal.

The discharge of the Coin is effected by the Pointer itself, which carries a Cam that acts on the Coin and ejects it when Gas equal in quantity to that which the Pointer indicates has been made available—but not before. The advantages of this arrangement over others in which the ejection of the Coin is due to Gravity alone, are so obvious as to merely require mentioning to be appreciated.

CHANGE-WHEEL SYSTEM.

Our Coin-Freed Meters, constructed on this principle, possess important advantages over other Coin Meters of the same type; the Mechanism being simpler and less liable to derangement than that of any similar Meter in the Market.

When the Mechanism has to be re-adjusted to suit changes in the Price of Gas, this is effected by removing two Wheels, and replacing them by others having the number of teeth required to give the exact quantity of Gas desired. This interchange is more readily performed in this than in other Meters; the Mechanism being so arranged that the removal of a single Pin or Screw enables the Wheels to be withdrawn and replaced, without serious trouble or loss of time. In a Meter of this type, this is a matter of great importance, especially where large numbers of Prepayment Meters have to be re-adjusted to suit alterations in the Price of Gas.

These Meters have been supplied in large quantities, and give great satisfaction wherever they are adopted.

SPECIAL FEATURES: UNIQUE PRICE-CHANGING ARRANGEMENTS. ACCURACY. COMPACTNESS. SIMPLICITY. DURABILITY.

GUARANTEED FOR FIVE YEARS.

W. & B. COWAN, LTD.

ESTABLISHED 1827.

SMITH SQUARE WORKS, WESTMINSTER,
LONDON, S.W.
TELEPHONE No. 250 WESTMINSTER.

DALTON STREET WORKS, NEWTOWN,
MANCHESTER.
TELEPHONE No. 1545.

BUCCLEUCH STREET WORKS,
EDINBURGH.
TELEPHONE No. 753.

COLONIAL METER WORKS, MACQUARIE PLACE,
SYDNEY, N.S.W.
TELEPHONE No. 2520.

TELEGRAPHIC ADDRESSES:
"DISC, LONDON." "DISC, MANCHESTER." 'DISC, EDINBURGH." "DISC, SYDNEY."

Telegraphic Codes used, A1 and A.B.C. 4th Edition. Special Code furnished on application.

THE SILICA FIRE-BRICK COMPANY,

OUGHTIBRIDGE, NEAR SHEFFIELD.

Established 1858. The First Manufactory of Silica and Dinas Fire-Bricks erected in England.

MANUFACTURERS OF

SILICA FIRE-BRICKS

(TRADE MARK "SILICA")

Specially adapted for Siemens-Martin Gas-Furnaces; also for Gas, Copper, Iron, Steel, and other Furnaces where intense heat is required.

BESSEMER GANNISTER, STEEL-FURNACE GANNISTER, COPPER-FURNACE GANNISTER, IRONFOUNDERS' CUPOLA SAND FINE-SETTING SILICA CEMENT, STEEL MOULDERS' COMPOSITION.

Our Silica Bricks have gained a high reputation for Unsurpassed Quality in most of the leading Firms in England and on the Continent. Export orders delivered Liverpool, Hull, Grimsby, or the Tyne.

HISLOP'S PATENT REGENERATIVE RETORT-SETTINGS

THESE SETTINGS SECURE THE RECORD PRODUCTION OF

1000 CUBIC FEET OF GAS PER LINEAL FOOT OF RETORT (Ordinary Section) per 24 HOURS from ENGLISH COAL, and

1200 CUBIC FEET FROM SCOTCH COAL,

Together with every other possible Advantage.

DURABILITY AND SIMPLICITY OF MANAGEMENT. LOWEST POSSIBLE FUEL ACCOUNT. PERFECT SATISFACTION GUARANTEED.

AGENTS: *Messrs. JONAS DRAKE & SON, Gas Engineers, Halifax, Yorkshire, for* ENGLAND, WALES *and* ABROAD. *C. M. HAMILTON, Retort Setter, Hamilton, for* SCOTLAND *and* IRELAND. *Enquiries may be addressed in the first instance, to the* PRINCIPAL AGENT:

R. F. HISLOP, Gas Engineer, CRAIGIELEA, PAISLEY.

JAMES MILNE & SON, LTD.,

MILTON HOUSE WORKS, EDINBURGH.

60, HOLBORN VIADUCT, LONDON. | 111, ST. VINCENT STREET, GLASGOW. | 48, WELLINGTON STREET, LEEDS.

CONSUMERS' WET AND DRY GAS-METERS.

PREPAYMENT WET AND DRY GAS-METERS.

STATION GOVERNORS.

PRESSURE-REDUCERS.

ENGINES & EXHAUSTERS.

VALVES.

PRESSURE-GAUGES.

MAIN COCKS.

S. CUTLER AND SONS, MILLWALL, LONDON.

CARBURETTED WATER-GAS PLANT.

ADOPTED AT

HORNSEY.	BUENOS AYRES.	SECOND ORDERS.
HASTINGS.	SOUTHALL.	
SOUTHEND.	PLYMOUTH.	SOUTHEND.
FOLKESTONE.	HARROW.	PLYMOUTH.

GASHOLDERS

OF EVERY SIZE AND DESCRIPTION.

CUTLER'S PATENT GUIDE-FRAMING FOR GASHOLDERS

HAS BEEN ADOPTED FOR MANY IMPORTANT HOLDERS.

IT IS STRONG AND CHEAP, AND REQUIRES NO PIERS FOR ITS SUPPORT.

THE HORSELEY CO., LTD., TIPTON, STAFFORDSHIRE.

MAKERS OF

GASHOLDERS & GAS PLANT,

PURIFIERS, SCRUBBERS, CONDENSERS, WASHERS, TANKS, VALVES, PIPES, LAMP PILLARS, RETORT-FITTINGS, ETC.

ALSO ALL KINDS OF

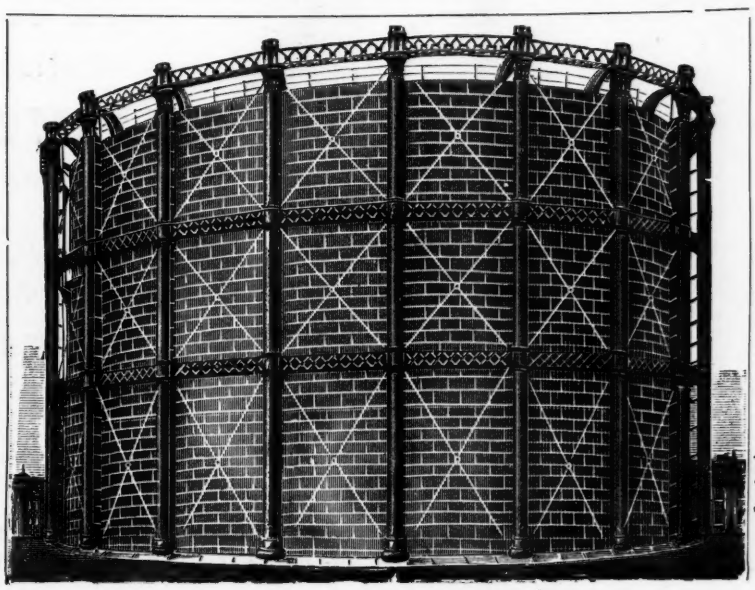
STRUCTURAL IRON

AND STEEL WORK.

BRIDGES.

ROOFS,

PIERS, ETC.



WORKS AND HEAD OFFICE
TIPTON,
STAFFORDSHIRE.

LONDON OFFICE:
11, VICTORIA ST.,
WESTMINSTER.

TELEGRAPHIC ADDRESSES
"HORSELEY, TIPTON."
"GALILEO, LONDON.

RETORT-SETTINGS

REGENERATOR.
GENERATOR.
FLOOR-LEVEL
GASEOUS SETTINGS.

GASHOLDER TANKS

BRICK & PUDDLE, OR
CEMENT RENDERED.
ALL SIZES.

MAIN LAYING

GAS & WATER FROM
MINIMUM TO
MAXIMUM SIZES.

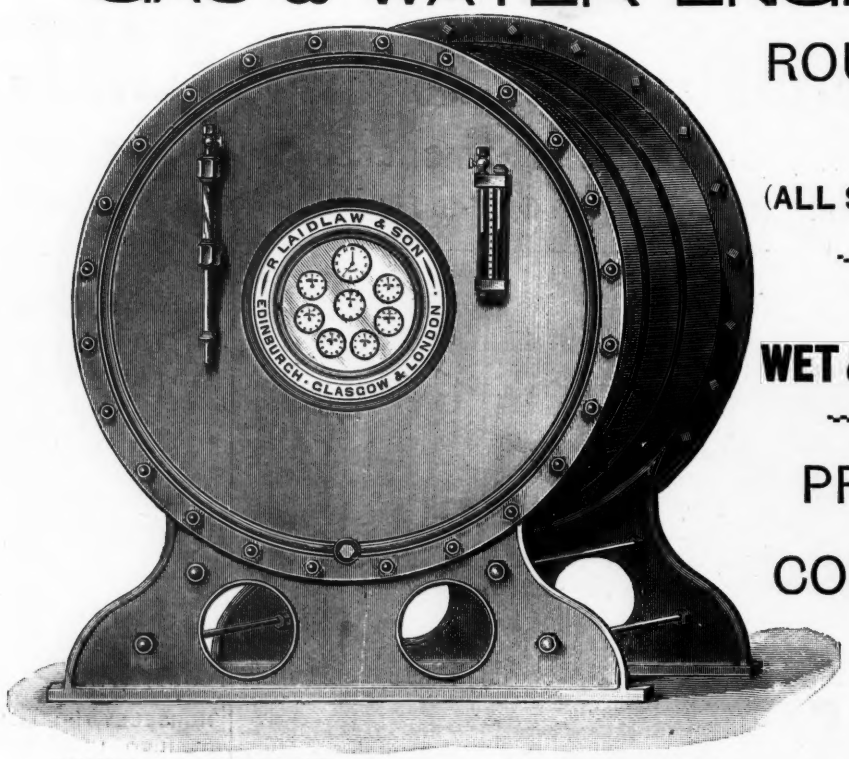
J. & H. ROBUS,

ENGINEERING CONTRACTORS FOR
GAS & WATER WORK OF EVERY DESCRIPTION,

20, BUCKLERSBURY, LONDON, E.C.

R. LAIDLAW & SON

GAS & WATER ENGINEERS.



ROUND OR SQUARE
STATION
(ALL SIZES) METERS.

CONSUMERS'
WET & DRY GAS-METERS.

PREPAYMENT
AND
COMPENSATING
METERS.

SIMON SQUARE WORKS
EDINBURGH. | ALLIANCE FOUNDRY,
GLASGOW. | 6, LITTLE BUSH LANE,
LONDON, E.C.

WOMBWELL MAIN COMPANY, LD.,
BARNSLEY.

BEST GAS COAL.

ANALYSIS: 11,390 feet of 17-Candle Gas. Value in Sperm per ton, 686 lbs.
By R. O. PATERSON, C.E.

APPLY

WOMBWELL MAIN COMPANY, LIMITED, BARNSLEY.

Telegrams: "MAIN, WOMBWELL."

STOCKPORT GASHOLDER

ON PEASE'S STEEL CABLE SYSTEM.

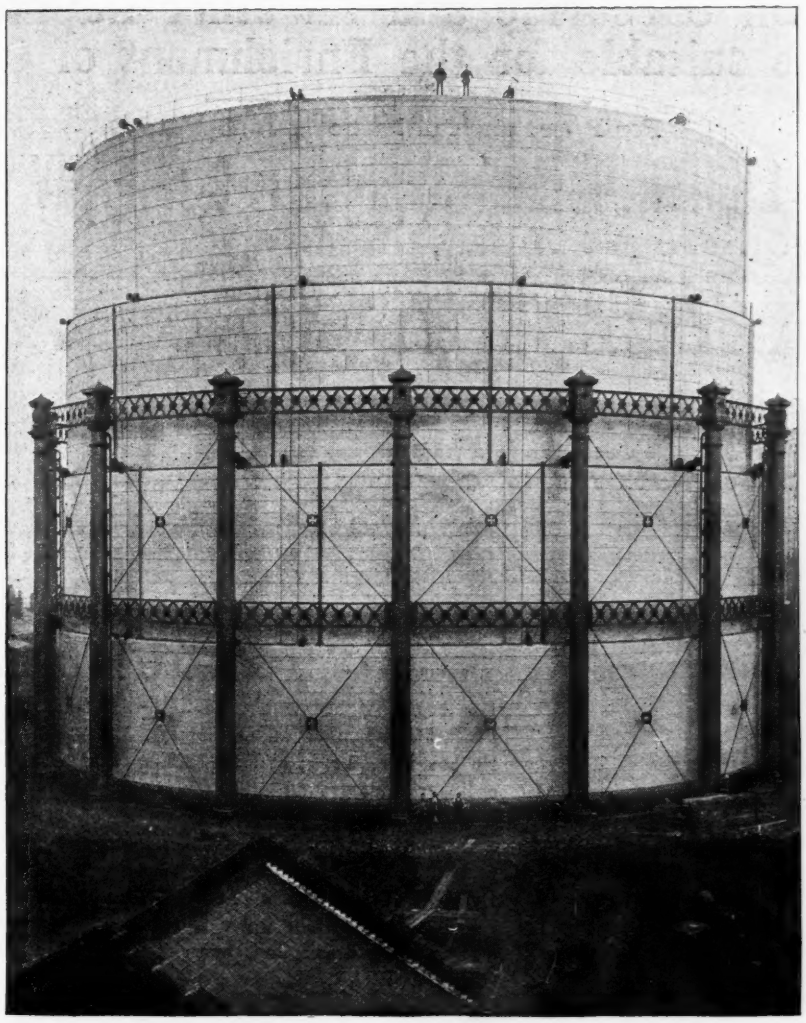
Great Saving in Cost, and Absolutely Reliable in Working.

TIME SAVED IN ERECTION.

WEIGHT SAVED.

FREIGHTS REDUCED.

INSPECTION INVITED.



THESE HOLDERS ARE CERTIFIED BY USERS TO BE STEADIER UNDER WIND PRESSURE THAN HOLDERS WITH COLUMNS.

INSPECTION INVITED.

TWO LIFTS ADDED WITH PATENT CABLE GUIDING (PEASE'S SYSTEM).
Enlarged under Patent 41,189, 1897, with Water in the Tank, for STOCKPORT CORPORATION.
(*From a Photograph.*)

Manufacturers and Patentees, Telegrams: "GASHOLDER."

ASHMORE, BENSON, PEASE, & CO., LIMITED,
STOCKTON-ON-TEES.

THE

MAXIM PATENT CARBURETTOR

FOR ENRICHING GAS IN BULK.

OVER 60 MAXIM PATENT CARBURETTORS HAVE NOW BEEN FIXED.

Among the Companies supplied are The Gas Light and Coke Company, The South Metropolitan Gas Company, Birmingham Corporation, Manchester Corporation, Rochdale Corporation, Bristol Gas Company, and many other Works, both large and small, where they have been working in some instances for the past **Seven Years.**

MORE GAS & SALEABLE COKE PER TON of COAL CARBONIZED is PRODUCED; SAVING CAPITAL, LABOUR, FUEL, WEAR & TEAR, &c.

THE ENRICHMENT IS INSTANTANEOUS AND PERMANENT.

The Carburettor is inexpensive, easily fixed, and entirely supersedes the use of Cannel.

SOLE AGENTS FOR REDWOOD & CLOWES' INFLAMMABLE VAPOUR & GAS DETECTORS.

Dealers in Carburine and all other Naphthas and Oils suitable for the Enrichment of Gas.

For Prices and full Particulars, apply to

THE GAS LIGHTING IMPROVEMENT COMPANY, LIMITED,

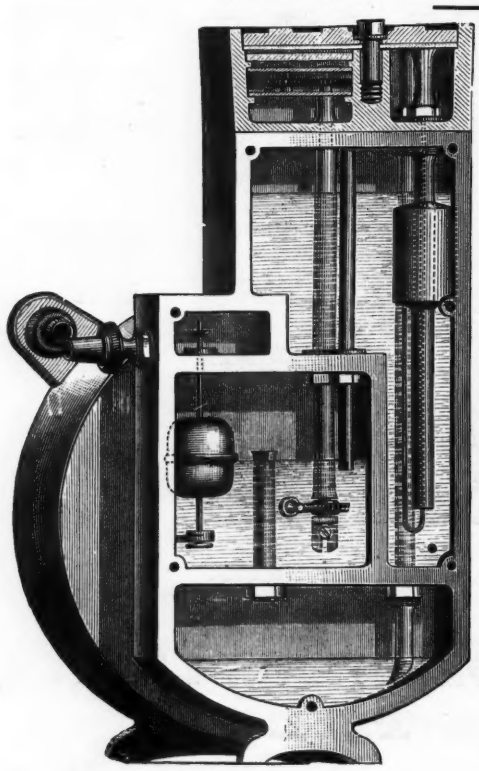
18, DEVONSHIRE STREET, BISHOPSGATE, LONDON, E.C.

ALDER AND MACKAY,

MANUFACTURERS OF

IMPROVED WET AND DRY GAS-METERS

IN CAST-IRON AND TIN CASES OF THE HIGHEST EXCELLENCE.



Sole Makers of Green's Patent Underground Wet Gas-Meters for Street Lighting, &c., and Ogden's Patent Spindle Tube for Wet Gas-Meters.

GREEN'S PATENT
UNDERGROUND METER

Has been designed to obviate that which has hitherto prevented the general adoption of underground Meters—namely, their serious cost. No box is required; and the saving thus effected as compared with ordinary underground Meters, where either a box or meter-pillar is necessary, is fully one-half. The price of one for three lights is 28s.; and the other sizes are correspondingly cheap. When fixed, the only part of the Meter exposed to view measures 6½ inches by 3½ inches. By the Indicator with which the Meter is fitted, the Inspector can at once discern whether water is required; but as the Meter is of the compensating description, water will probably need only be supplied ONCE A YEAR. It is advisable to fill the Meter with a non-freezing liquid which does not injure the fittings; and this can be supplied at about 1s. 3d. per gallon.

Prices and all Information on Application.

NEW GRANGE WORKS, EDINBURGH.

HIGHEST AWARDS given for our WET and DRY METERS at

Exhibitions held at GLASGOW, CALCUTTA, and EDINBURGH.

THE

DENAYROUZE LIGHT SYNDICATE, LTD.,

BEG to announce that, having made arrangements for the Manufacture of their **BURNERS** in England, they are **NOW ABLE TO SUPPLY THESE IN ANY QUANTITY.**

These Burners (with Mantles specially made for the Syndicate by the Incandescent Gas-Light Company, Ltd., under the Welsbach Patents) are admitted by all Experts to be the **BEST AND MOST ECONOMICAL LIGHTS FOR LARGE AREAS AND PUBLIC STREETS.**

NO CHIMNEYS REQUIRED.

Press Notices and Opinions from all the leading Gas Managers throughout the Kingdom can be seen on applying to

CHARLES EDWARD MASTERMAN,
GENERAL MANAGER.

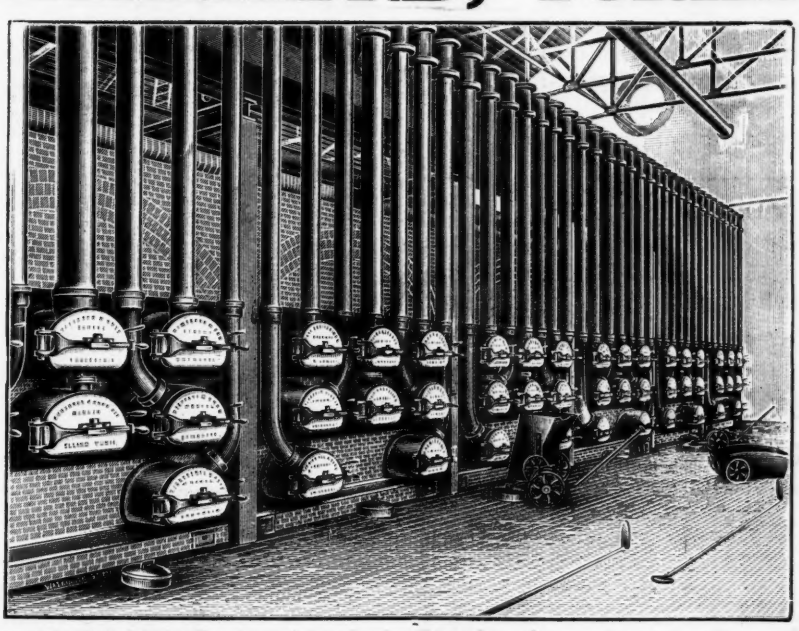
28, VICTORIA STREET, LONDON, S.W.

R. DEMPSTER & SONS,

LIMITED.

ELLAND, YORKS.

DIRECT-FIRED GENERATOR AND REGENERATOR SETTINGS



AND RETORT WORK IN ALL ITS BRANCHES.

REGENERATIVE RETORT-BENCH ERECTED COMPLETE BY R. D. & S., Ltd. (From a Photo.)

CONTRACTORS FOR COMPLETE INSTALLATIONS ON HORIZONTAL OR INCLINED SYSTEMS WITHOUT SUB-CONTRACTING.

BOWENS' Ltd. Successors,
STOURBRIDGE.

MANUFACTURERS OF
BEST FIRE-BRICKS; INCLINED, HORIZONTAL, and SECTIONAL RETORTS; LUMPS, TILES, &c., of every description.

Established 1860.

TESTED, TRIED, AND TRUE.

INCANDESCENT GAS-LIGHT

Better than all other Incandescent Systems, and not Infringing any Patent.

Complete, with Burner and Mantle, £7 10s. per 100.
Incandescent Mantles ready for use, £2 10s. per 100.

These Articles are made from the very best Materials. They will last a very long time, and give more light than the generality of other Systems.

The "UNION" INCANDESCENT GAS-LIGHT CO.
WACHSNER & JONAS,
BERLIN O. 2*a* An der Stadtbahn 2*a*.

WILSON CARTER & PEARSON,

GAS COAL AND CANNEL FACTORS,

Supply to any Railway Station, or for Export, all kinds of Fuel for Gas purposes.

ADDRESS CHIEF OFFICES:

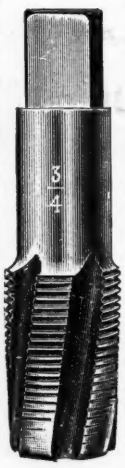
Temple Buildings, 50, New Street, Birmingham.

PATENT TWISTED TAPER
RYMERS & TAPS.

These **Patent Twisted Taper Rymers and Taps** are the best ever made for Gas and Water Service Connections. A true Hole and a correct Thread can be assured. They are easy to work, and will last much longer than straight grooved Taps and Rymers.

THOUSANDS ARE IN DAILY USE.

Also SCREWING-MACHINES, STOCKS and DIES (with Patent Twisted Dies), PIPE-TONGS, and other TOOLS.



Apply for Prices and Particulars to

JOHN RUSCOE,

ALBION WORKS, HYDE, near MANCHESTER.

WILLIAM INGHAM & SONS,

Incorporated with the Leeds Fire-Clay Company, Ltd.,

WORTLEY FIRE-CLAY WORKS,
Near LEEDS,

Have confidence in drawing the special attention of GAS ENGINEERS to the following advantages of their Retorts:—

1. Smooth interior, preventing adhesion of Carbon.
2. They can be made in one piece up to 10 feet long.
3. Uniformity in thickness, ensuring equal Expansion and Contraction.

PATENT
MACHINE-MADE GAS-RETORTS.

PETTIGREW'S PATENT

Sulphate of Ammonia Plant

ON THE CONTINUOUS SYSTEM

Is the newest in the Market, and is the outcome of practical experience in Sulphate Making.

Old Systems easily and cheaply converted.

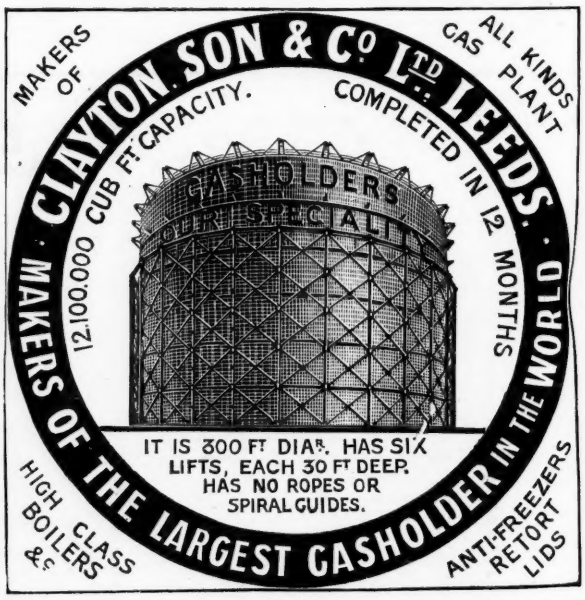
ANY SIZE ERECTED COMPLETE AT HOME OR ABROAD.

Makers of Self-Emptying Saturators.

Write for Particulars, Testimonials, and References to

GEO. PETTIGREW & Co.,

GAS AND CHEMICAL ENGINEERS,
MIDDLESBROUGH-ON-TEES.


MAKERS OF
CLAYTON, SON & Co LTD LEEDS.
ALL KINDS GAS PLANT
12,100,000 CUB FT CAPACITY.
COMPLETED IN 12 MONTHS
GASHOLDERS
OUR SPECIALITY
IT IS 300 FT DIAR. HAS SIX LIFTS, EACH 30 FT DEEP. HAS NO ROPES OR SPIRAL GUIDES.
MAKERS OF THE LARGEST GASHOLDER IN THE WORLD
HIGH CLASS BOILERS &c
ANTI-FREEZERS RETORT LIDS

GIRDERS, ROOFS, & ALL KINDS OF STRUCTURAL IRONWORK.

London Office: 60, QUEEN VICTORIA STREET, E.C.

Telegraphic Addresses: "GAS, LEEDS," "ECLARAGE, LONDON."

G. & J. HAIGH,

Raven's Lodge Fire-Brick Works, DEWSBURY,

Manufacturers of MACHINE-MADE RETORTS and

FIRE-BRICKS of the highest Quality, made from Fire-Clay of a most Superior and Refractory Character, suitable for **GLASS-WORKS, GAS-WORKS, and BLAST-FURNACES.**

For Prices and Analysis, apply as above.

HARPER & MOORES,
STOURBRIDGE.

MANUFACTURERS OF
BEST FIRE-BRICKS, GAS-RETORTS,
LUMPS, TILES, AND ALL ARTICLES IN FIRE-CLAY.
Proprietors of Best Glasshouse Pot, Crucible, and other Stourbridge Clays.
MANUFACTURERS OF GLASSHOUSE POTS AND CRUCIBLES OF EVERY KIND.
ESTABLISHED 1826.

JOSEPH CLIFF & SONS,
INCORPORATED IN
THE LEEDS FIRE-CLAY COMPANY, Ltd.
WORTLEY, LEEDS.

LONDON OFFICES & DEPÔTS:
Baltic Wharf, Waterloo Bridge.
WHARVES NOS. 2 & 4, INSIDE G.N. GOODS YARD, KING'S CROSS, N.
LIVERPOOL:
16, Lightbody Street.
LEEDS:
Queen Street.

MACHINE-MADE RETORTS

Have been made in large quantities for the last twelve years; and during the whole of that time, have been in regular use at most of the largest Gas-Works in the Kingdom. They possess the excellent quality of remaining as near stationary as possible under the varying conditions of their work—a quality which will be appreciated by all Gas Engineers and Managers. The generally expressed opinion is that these Retorts are the very best that are made.

RETORTS CAREFULLY PACKED FOR EXPORT.
Fire-Bricks, Lumps, Tiles, &c., &c., of every description suitable for Gas-Works.

GODDARD, MASSEY, & WARNER'S
IMPROVED
Sulphate of Ammonia Apparatus.

The most successful and approved Apparatus known up to the present time.

FOR REFERENCES, PARTICULARS, TESTIMONIALS, AND PRICES APPLY TO

GODDARD, MASSEY, & WARNER,
ENGINEERS,
NOTTINGHAM.

The Apparatus has been supplied to the following Firms—

BURT BOULTON, & HAYWOOD, SILVERTOWN, and ELING.
CHANCE BROTHERS, OLDBURY (Four Apparatus).
RUNCORN SOAP & ALKALI CO., Limited, RUNCORN.
NETHAM CHEMICAL CO., Limited, BRISTOL.
ANIMAL CHARCOAL CO., Limited SHADWELL.
WM. BUTLER & CO., BRISTOL.
KEMPSON & CO., Pye Bridge.

And to the following Gas Companies and Corporations—

ILKESTON.
WIDNES.
HALIFAX.
ALTRINCHAM.
DENTON.
ST. ALBANS.
DUKINFIELD.
NORTHWICH.
HUDDERSFIELD.
BURY.
BRIGHOUSE.
MARKET HARBRO'
PRESCOT.
SOWERBY BRIDGE.
LEICESTER.
DARWEN.
NELSON.
ORMSKIRK.
CHORLEY.
WHITEHAVEN.
CHESTER.
SOUTH SHIELDS.
LEEK.
IPSWICH.
BOURNEMOUTH.
SALFORD.
LUTON.
HAMPTON COURT.

R. & J. DEMPSTER, LTD.,
GAS PLANT WORKS,
NEWTON HEATH, MANCHESTER.

Wrought Iron or Steel
Annular Condensers.

PRICES AND PARTICULARS ON APPLICATION.

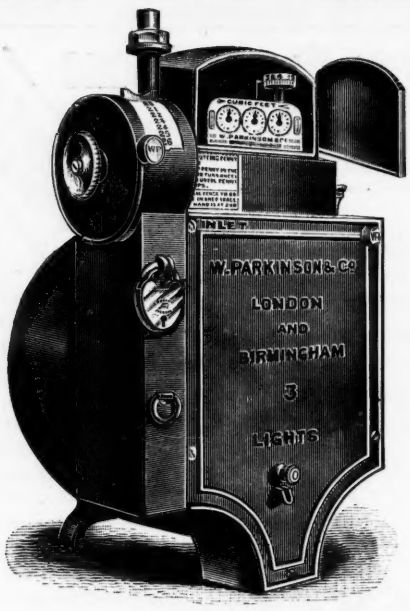
The Annular Condensers illustrated have been recently erected at the Blackpool Corporation Gas-Works, to Designs and under the Superintendence of J. Chew, Esq., C.E.

The Connections and Valves are arranged so that one-third, two-thirds, or the whole of the Condensers may be worked as desired.

London Office: 165, Gresham House, Old Broad Street, E.C.

PARKINSON'S

PREPAYMENT GAS-METERS.



Many Thousands in use in all parts of the Country.

COMBINE SIMPLICITY WITH STRENGTH.

ACCURACY WITH COMPACTNESS.

Adapted for use with PENNIES, SHILLINGS, or other English or Foreign Coins.

PRICE-CHANGING EFFECTED IN THE SIMPLEST MANNER AND WITH ABSOLUTE EXACTITUDE.

Coin Mechanism accessible, and easily taken apart in case of ill-usage, &c.

GUARANTEED FOR FIVE YEARS.

W. PARKINSON & CO.,

Cottage Lane Works, CITY ROAD, LONDON.
Bell Barn Road Works, BIRMINGHAM.

Telegraphic Addresses { "INDEX, LONDON." / "GAS-METERS, BIRMINGHAM." }

Telephone Numbers (National) { London 778 King's Cross. / Birmingham 1101. }

[See also Advt. p. 990.

LONDON: Printed by WALTER KING (at the Office of King, Sell, and Railton, Ltd., 12, Gough Square); and published by him at 11, Bolt Court, Fleet Street, in the City of London.—Tuesday, May 3, 1898.